Operating instructions

EN

welding torch

TIG 200 GRIP GD, -CW, -U/D, -HFL
TIG 260 GRIP WD, -CW, -U/D, -HFL, -WO
TIG 260 GRIP WD, -HW, -U/D, -HFL, -WO
TIG 450 GRIP WD, -CW, -U/D, -HFL, -WO
TIG 450 GRIP WD, -HW, -U/D, -HFL, -WO

099-500091-EW501 | Observe additional system documents! | 19.04.2017

General instructions

⚠ WARNING

Read the operating instructions!
The operating instructions provide an introduction to the safe use of the products.

- Read and observe the operating instructions for all system components, especially the safety instructions and warning notices!
- Observe the accident prevention regulations and any regional regulations!
- The operating instructions must be kept at the location where the machine is operated.
- Safety and warning labels on the machine indicate any possible risks.
  Keep these labels clean and legible at all times.
- The machine has been constructed to state-of-the-art standards in line with any applicable regulations and industrial standards. Only trained personnel may operate, service and repair the machine.
- Technical changes due to further development in machine technology may lead to a differing welding behaviour.

☞ ***In the event of queries on installation, commissioning, operation or special conditions at the installation site, or on usage, please contact your sales partner or our customer service department on +49 2680 181-0.***

A list of authorised sales partners can be found at www.ewm-group.com.

Liability relating to the operation of this equipment is restricted solely to the function of the equipment. No other form of liability, regardless of type, shall be accepted. This exclusion of liability shall be deemed accepted by the user on commissioning the equipment.
The manufacturer is unable to monitor whether or not these instructions or the conditions and methods are observed during installation, operation, usage and maintenance of the equipment.

An incorrectly performed installation can result in material damage and injure persons as a result. For this reason, we do not accept any responsibility or liability for losses, damages or costs arising from incorrect installation, improper operation or incorrect usage and maintenance or any actions connected to this in any way.

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56271 Mündersbach
Germany

1 Contents

2 For your safety

2.1 Notes on the use of these operating instructions

⚠ DANGER

Working or operating procedures which must be closely observed to prevent imminent serious and even fatal injuries.

- Safety notes include the "DANGER" keyword in the heading with a general warning symbol.
- The hazard is also highlighted using a symbol on the edge of the page.

⚠ WARNING

Working or operating procedures which must be closely observed to prevent serious and even fatal injuries.

- Safety notes include the "WARNING" keyword in the heading with a general warning symbol.
- The hazard is also highlighted using a symbol in the page margin.

⚠ CAUTION

Working or operating procedures which must be closely observed to prevent possible minor personal injury.

- The safety information includes the "CAUTION" keyword in its heading with a general warning symbol.
- The risk is explained using a symbol on the edge of the page.

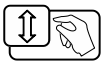
☞ ***Special technical points which users must observe.***

Instructions and lists detailing step-by-step actions for given situations can be recognised via bullet points, e.g.:

- Insert the welding current lead socket into the relevant socket and lock.

2.2 Explanation of icons

Symbol	Description
	Indicates technical aspects which the user must observe.
	Switch off machine
	Switch on machine
	Wrong
	Correct
	Menu entry
	Navigating the menu
	Exit menu
	Time representation (e.g.: wait 4 s/activate)
	Interruption in the menu display (other setting options possible)
	Tool not required/do not use
	Tool required/use

Symbol	Description
	Activate and release/tap/tip
	Release
	Press and keep pressed
	Switch
	Turn
	Numerical value – adjustable
	Signal light lights up in green
	Signal light flashes green
	Signal light lights up in red
	Signal light flashes red

2.3 Part of the complete documentation

☞ ***These operating instructions are part of the complete documentation and valid only in combination with all other parts of these instructions! Read and observe the operating instructions for all system components, especially the safety instructions!***

The illustration shows a general example of a welding system.

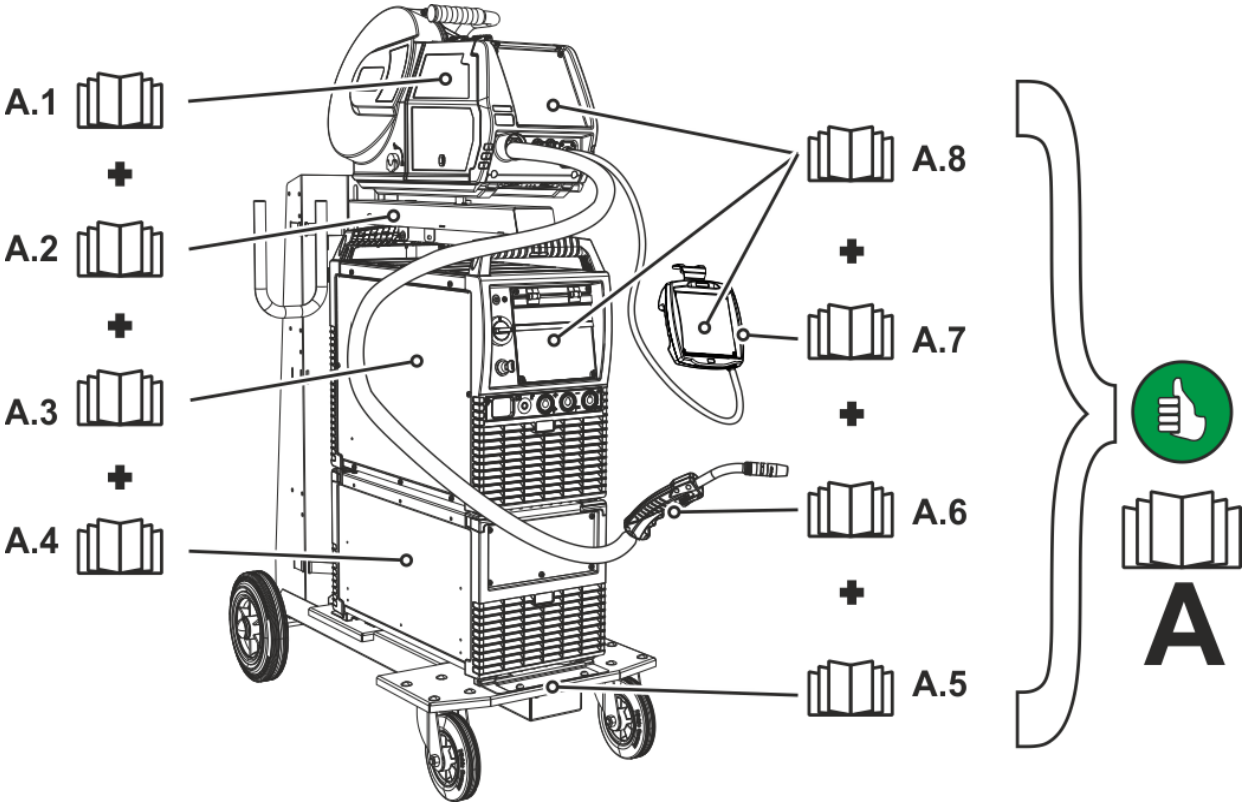


Figure 2-1

Item	***Documentation***
A.1	Wire feeder
A.2	Conversion instructions
A.3	Power source
A.4	Cooling unit, voltage converter, tool box etc.
A.5	Trolley
A.6	Welding torch
A.7	Remote control
A.8	Control
A	Complete documentation

3 Intended use

⚠ WARNING

§ **Hazards due to improper usage!**
The machine has been constructed to the state of the art and any regulations and standards applicable for use in industry and trade. It may only be used for the welding procedures indicated at the rating plate. Hazards may arise for persons, animals and material objects if the equipment is not used correctly. No liability is accepted for any damages arising from improper usage!

- The equipment must only be used in line with its designated purpose and by trained or expert personnel!
- Do not improperly modify or convert the equipment!

3.1 Applications

Welding torch for TIG welding with arc welding machines.

3.2 Use and operation solely with the following machines

	TIG 200 GRIP GD CW U/D HFL	TIG 260 GRIP WD CW U/D HFL WO	TIG 260 GRIP WD HW U/D HFL WO	TIG 450 GRIP WD CW U/D HFL WO	TIG 450 GRIP WD HW U/D HFL WO
tigSpeed drive 45 hotwire	☑	☑	☑	☑	☑
tigSpeed drive 45 coldwire	☑	☑	☐	☑	☐
Tetrix drive 4L	☑	☑	☐	☑	☐
Tetrix 270 hotwire	☐	☐	☑	☐	☑

3.3 Overview of device types

Version	Functions	Torch type
CW	**Cold wire** For cold wire welding	TIG 200, TIG 260, TIG 450
GRIP	**GRIP grip** Ergonomic grip for secure handling	TIG 200, TIG 260, TIG 450
GD	**Standard** Gas-cooled with decentral connection	TIG 200
HFL	**Highly flexible hose package**	TIG 200, TIG 260, TIG 450
HW	**Hot wire** For hot wire welding	TIG 260, TIG 450
WD	**Standard** Water-cooled with decentral connection	TIG 260, TIG 450
U/D	**Up/down torch** Setting and display of welding current, programs/JOB	TIG 200, TIG 260, TIG 450
WO	**Wire outside**	TIG 260, TIG 450

3.4 Documents which also apply

3.4.1 Warranty

☞ ***For more information refer to the "Warranty registration" brochure supplied and our information regarding warranty, maintenance and testing at www.ewm-group.com!***

3.4.2 Declaration of Conformity

The labelled machine complies with the following EC directives in terms of its design and construction:

- Low Voltage Directive (LVD)
- Electromagnetic Compatibility Directive (EMC)
- Restriction of Hazardous Substance (RoHS)

In case of unauthorised changes, improper repairs, non-compliance with specified deadlines for "Arc Welding Equipment – Inspection and Testing during Operation", and/or prohibited modifications which have not been explicitly authorised by EWM, this declaration shall be voided. An original document of the specific declaration of conformity is included with every product.

3.4.3 Service documents (spare parts)

⚠ WARNING

Do not carry out any unauthorised repairs or modifications!
To avoid injury and equipment damage, the unit must only be repaired or modified by specialist, skilled persons!
The warranty becomes null and void in the event of unauthorised interference.

- Appoint only skilled persons for repair work (trained service personnel)!

Spare parts can be obtained from the relevant authorised dealer.

4 Machine description – quick overview

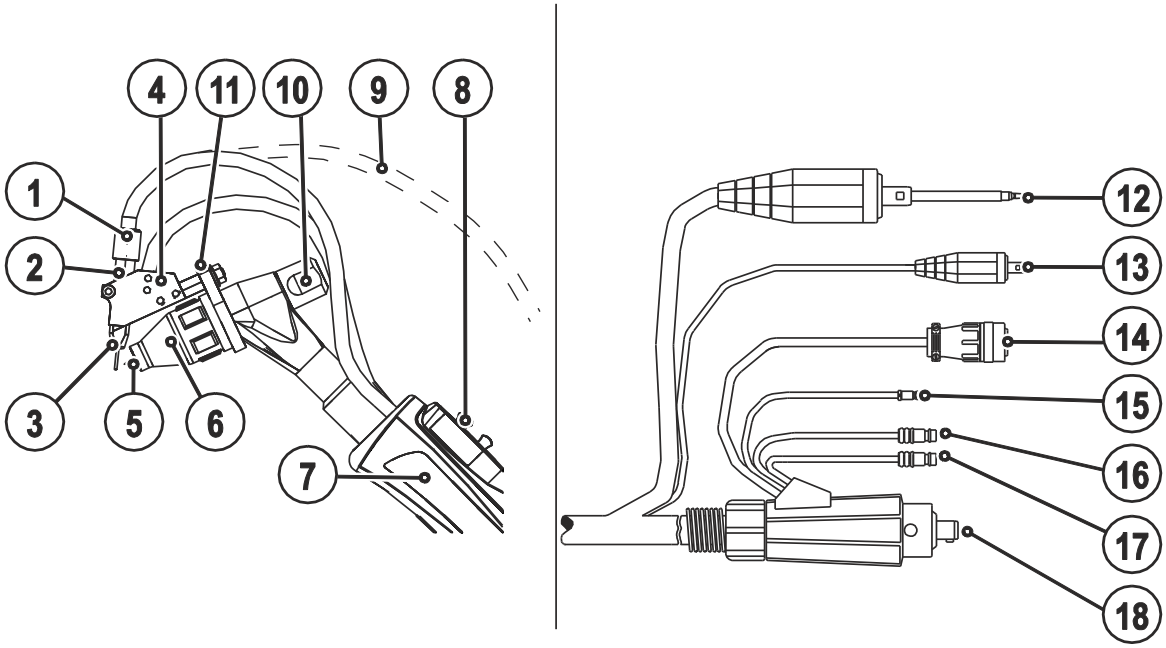


Figure 4-1

Item	Symbol	Description
1		**Crown nut**
2		**Connecting sleeve**
3		**Contact tip (wire guide)**
4		**Filler wire guide**
5		**Tungsten electrode**
6		**Gas nozzle**
7		**Torch body**
8		**Operating elements**
9		**Filler wire guide - WO version**
10		**Back cap**
11		**Support plate**
12		**Wire guide connector plug**
13		**Welding current connector plug (hot wire) - HW version** Minus potential
14		**Control lead cable plug**
15		**Connecting nipple, shielding gas** Rapid-action closure
16		**Rapid-action closure nipple, red - WD version** Coolant return
17		**Rapid-action closure nipple, blue - WD version** Coolant supply
18	▬	**Welding current connection (TIG)** decentralised, minus potential

4.1 Ways of combination

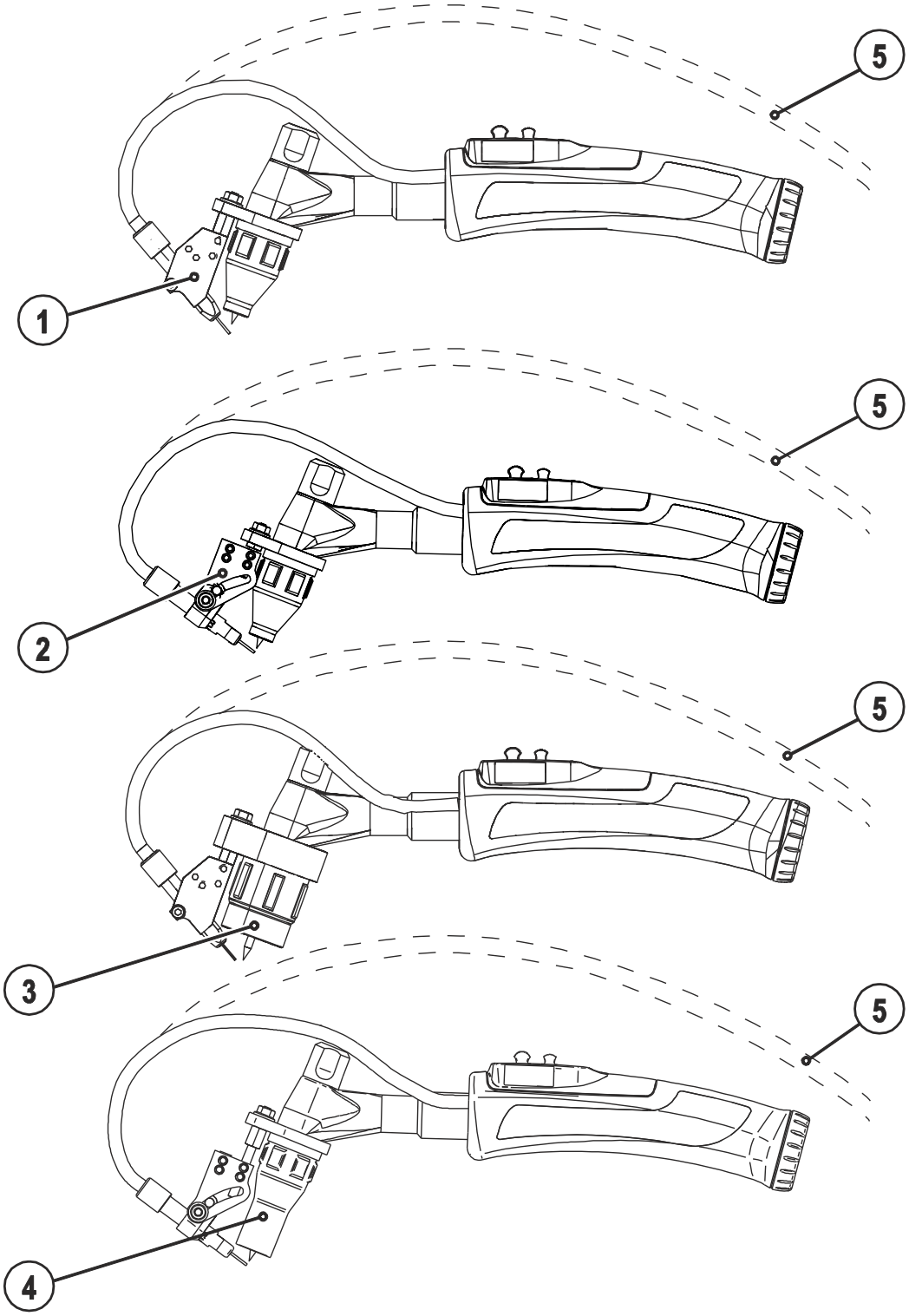
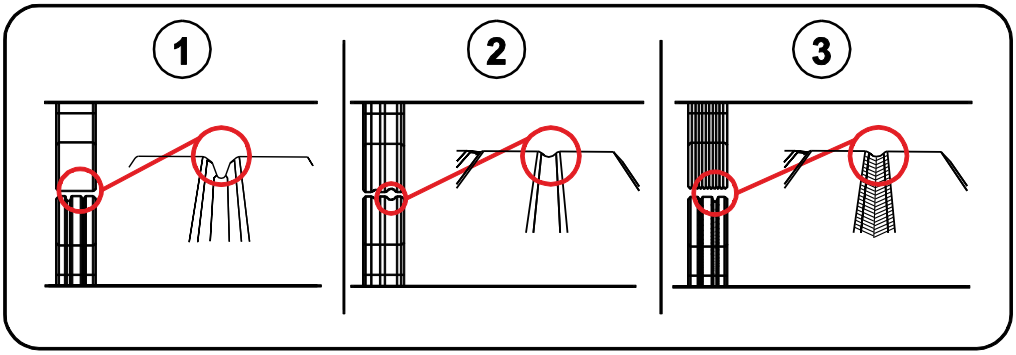


Figure 4-2

Item	Symbol	Description
1		Filler wire guide Fix 30°/39°/42°
2		Flexible filler wire guide (15°–41°)
3		Gas nozzle for jumbo version
4		Bottle neck gas nozzle version
5		Filler wire guide - WO version

4.2 Equipment recommendations

	Material	Wire diameter	Contact tip	Wire guide diameter	Liner	Brass liner length	Equipment side	Wire feed rolls
Wire fed	Low-alloy	0.8	EWM CuCrZr	1.5 x 4.0	Liner		Dinse connector	V-groove
		1.0		1.5 x 4.0				
		1.2		2.0 x 4.0				
	Medium-alloy	0.8	EWM CuCrZr	1.5 x 4.0	Combined PA liner	30 mm	Torch neck	V-groove
		1.0		1.5 x 4.0				
		1.2		2.0 x 4.0				
	Hardfacing	0.8	EWM CuCrZr	1.5 x 4.0	Combined PA liner	30 mm	Torch neck	V-groove
		1.0		1.5 x 4.0				
		1.2		2.0 x 4.0				
	High-alloy	0.8	EWM CuCrZr	1.5 x 4.0	Combined PA liner	30 mm	Torch neck	V-groove
		1.0		1.5 x 4.0				
		1.2		2.0 x 4.0				
	Aluminium	0.8	EWM Alu E-Cu	1.5 x 4.0	Combined PA liner	30 mm	Torch neck	U-groove
		1.0		1.5 x 4.0				
		1.2		2.0 x 4.0				
	Copper alloy	0.8	EWM CuCrZr	1.5 x 4.0	Combined PA liner	30 mm	Torch neck	V-groove
		1.0		1.5 x 4.0				
		1.2		2.0 x 4.0				
Flux cored wire fed	Low-alloy	0.8	EWM CuCrZr	1.5 x 4.0	Liner		Dinse connector	V-groove/knurled
		1.0		1.5 x 4.0				
		1.2		2.0 x 4.0				
	High-alloy	0.8	EWM CuCrZr	1.5 x 4.0	Combined PA liner	30 mm	Torch neck	V-groove/knurled
		1.0		1.5 x 4.0				
		1.2		2.0 x 4.0				



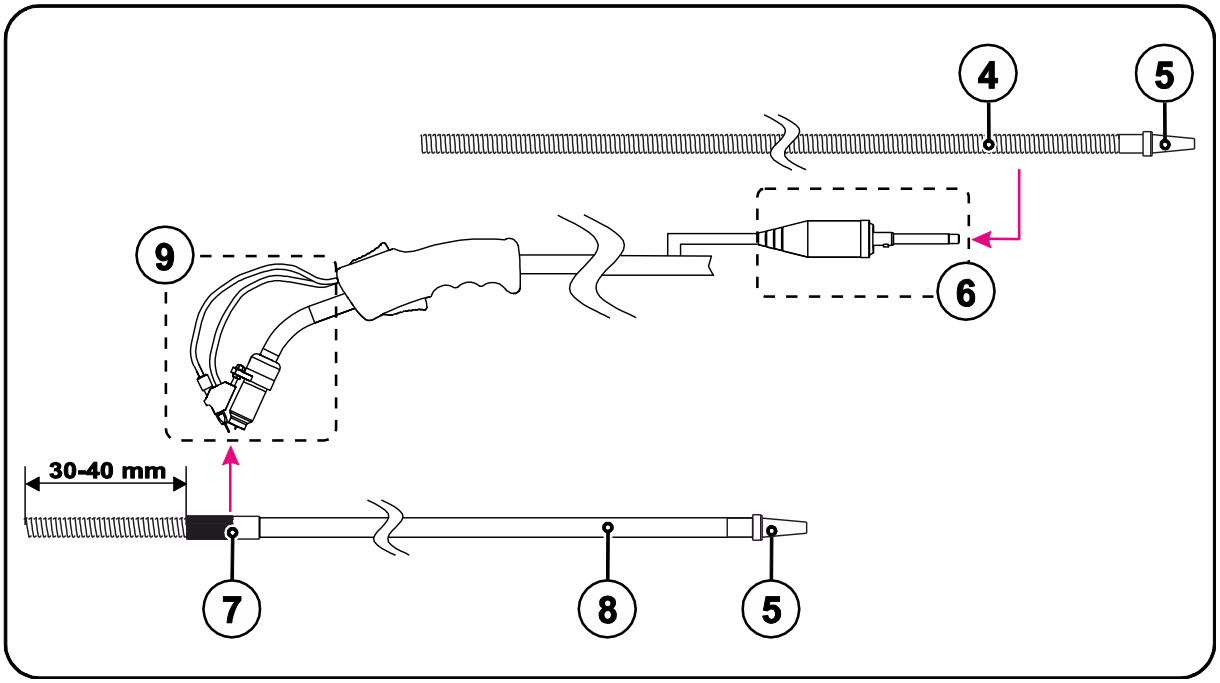


Figure 4-3

Item	Symbol	Description
1		V-groove
2		U-groove
3		Knurled V-groove
4		Steel liner
5		Wire feed nipple
6		Equipment side – Dinse connector
7		Connecting sleeve
8		Combined liner
9		Equipment side – torch neck

☞ ***A steel liner is installed at the connection side, whereas a combined liner is installed at the torch side.***

4.3 Machine control – Operating elements

☞ ***Up to four functions can be controlled with the two torch rockers (torch triggers BRT 1 to BRT 4).***

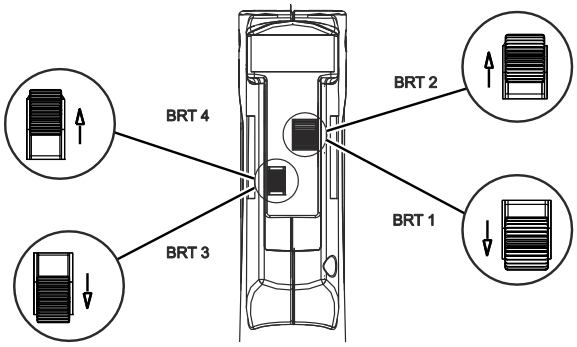


Figure 4-4

Torch trigger	Function
BRT 1	Welding current (start/stop)
BRT 2	Wire control (start/stop)
BRT 3	Increase welding current (up function)
BRT 4	Reduce welding current (down function)

5 Design and function

5.1 General

⚠ WARNING

Risk of injury from electric shock!
Contact with live parts, e.g. welding current sockets, is potentially fatal!

- Follow safety instructions on the opening pages of the operating instructions.
- Commissioning may only be carried out by persons who have the relevant expertise of working with arc welding machines!
- Connection and welding leads (e.g. electrode holder, welding torch, workpiece lead, interfaces) may only be connected when the machine is switched off!

⚠ CAUTION

Risk of injury due to moving parts!
The wire feeders are equipped with moving parts, which can trap hands, hair, clothing or tools and thus injure persons!

- Do not reach into rotating or moving parts or drive components!
- Keep casing covers or protective caps closed during operation!

Risk of injury due to welding wire escaping in an unpredictable manner!
Welding wire can be conveyed at very high speeds and, if conveyed incorrectly, may escape in an uncontrolled manner and injure persons!

- Before mains connection, set up the complete wire guide system from the wire spool to the welding torch!
- Check wire guide at regular intervals!
- Keep all casing covers or protective caps closed during operation!

☞ ***Accessory components and the power source itself can be damaged by incorrect connection!***

- ***Only insert and lock accessory components into the relevant connection socket when the machine is switched off.***
- ***Comprehensive descriptions can be found in the operating instructions for the relevant accessory components.***
- ***Accessory components are detected automatically after the power source is switched on.***

☞ ***Protective dust caps protect the connection sockets and therefore the machine against dirt and damage.***

- ***The protective dust cap must be fitted if there is no accessory component being operated on that connection.***
- ***The cap must be replaced if faulty or if lost!***

☞ ***Read and observe the documentation to all system and accessory components!***

5.2 Welding torch cooling system

5.2.1 Coolant

☞ ***Insufficient frost protection in the welding torch coolant!***
Depending on the ambient conditions, different liquids are used for cooling the welding torch > see 5.2.1.1 chapter.
Coolants with frost protection (KF 37E or KF 23E) must be checked regularly to ensure that the frost protection is adequate to prevent damage to the machine or the accessory components.

- ***The coolant must be checked for adequate frost protection with the TYP 1 frost protection tester .***
- ***Replace coolant as necessary if frost protection is inadequate!***

☞ ***Coolant mixtures!***
Mixtures with other liquids or the use of unsuitable coolants result in material damage and renders the manufacturer's warranty void!

- ***Only use the coolant described in this manual (overview of coolants).***
- ***Do not mix different coolants.***
- ***When changing the coolant, the entire volume of liquid must be changed.***

☞ ***Dispose of the coolant in accordance with local regulations and the material safety data sheets (German waste code number: 70104).***
May not be disposed of in household waste.
Prevent entry into sewers.
Absorb with liquid-binding material (sand, gravel, acid-binding agents, universal binding agents, sawdust).

5.2.1.1 Approved coolants overview

Coolant	Temperature range
KF 23E (Standard)	-10 °C to +40 °C
KF 37E	-20 °C to +10 °C

5.2.1.2 Maximal hose package length

	Pump 3.5 bar	Pump 4.5 bar
Machines with or without separate wire feeder	30 m	60 m
Compact machines with additional intermediate drive (example. miniDrive)	20 m	30 m
Machines with separate wire feeder and additional intermediate drive (example: miniDrive)	20 m	60 m

Data as a rule refer to the entire hose package length
including welding torch. The pump output is shown on the type plate (parameter: Pmax).
Pump 3.5 bar: Pmax = 0.35 MPa (3.5 bar)
Pump 4.5 bar: Pmax = 0.45 MPa (4.5 bar)

5.3 Welding torch connection

☞ ***Equipment damage due to improperly connected coolant pipes!***
If the coolant pipes are not properly connected or a gas-cooled welding torch is used, the coolant circuit is interrupted and equipment damage can occur.

- ***Connect all coolant pipes correctly!***
- ***Completely unroll the hose package and the torch hose package!***
- ***Observe maximal hose package length > see 5.2.1.2 chapter.***
- ***When using a gas-cooled welding torch, use a hose bridge to establish the coolant circuit .***

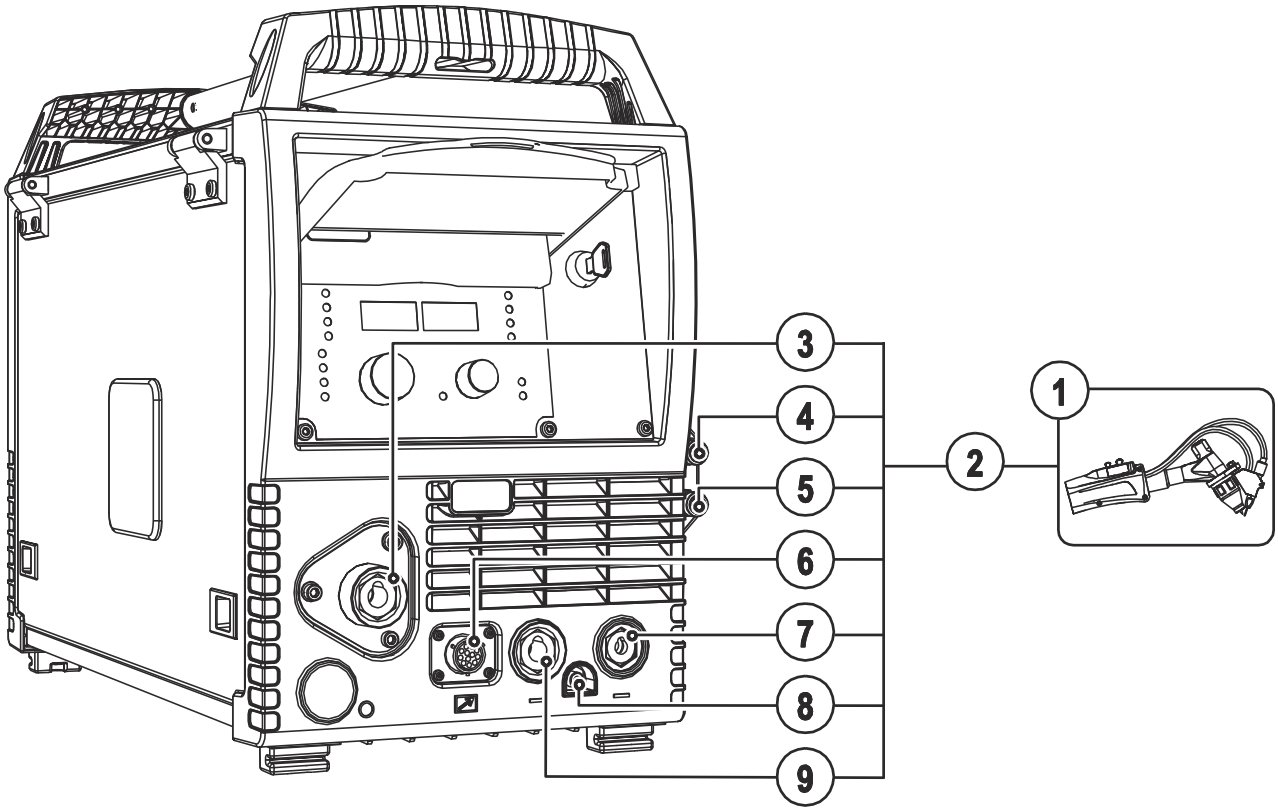


Figure 5-1

Item	Symbol	Description
1		**Welding torch** Observe additional system documents!
2		**Welding torch hose package**
3		**Wire electrode connection** Welding torch wire feed
4		**Quick connect coupling (red)** coolant return
5		**Quick connect coupling (blue)** coolant supply
6		**Connection socket (12-pole)** Welding torch control lead
7		**Connection socket (TIG hot wire)** Hot wire power, minus potential
8		**Quick connect coupling** Shielding gas
9		**Connection socket (TIG)** Welding current, minus potential

- Extend and lay out the torch hose package.
- Insert the wire feed plug of the welding torch into the wire electrode connector and lock by turning to the right.
- Push the cable plug for the welding current (TIG) onto the connection socket (TIG) and lock by turning to the right.
- Insert shielding gas rapid-action closure nipple in the quick connect coupling and engage.
- Insert welding torch control lead into the 12-pole connection socket and secure with the crown nut.

If fitted:

- Lock connecting nipples of the cooling water tubes into the corresponding quick connect couplings: Return line red to quick connect coupling, red (coolant return) and supply line blue to quick connect coupling, blue (coolant supply).
- Push the cable plug for the hot wire current onto the connection socket (TIG hot wire) and lock by turning to the right.

5.3.1 Control cable pin configuration

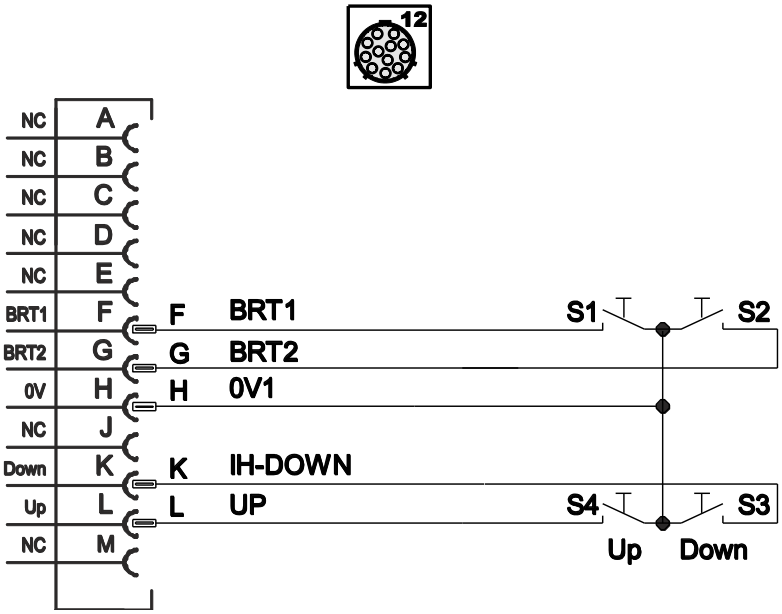


Figure 5-2

5.4 Equipping the welding torch

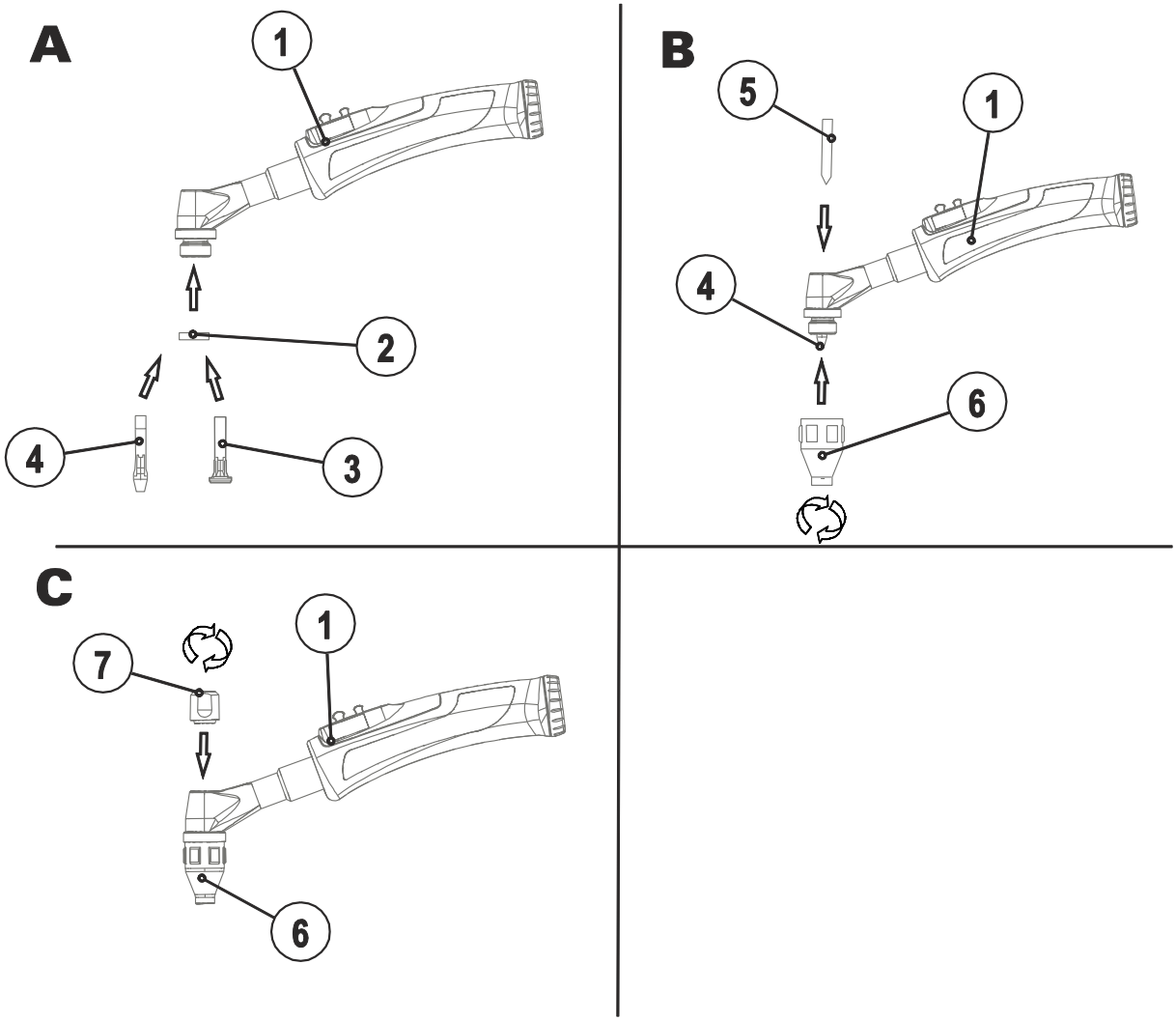


Figure 5-3

Item	Symbol	Description
1		**Torch body**
2		**Insulation**
3		**Gas lens** Area of application: high-alloy steels and aluminium materials
4		**Collet**
5		**Electrode**
6		**Gas nozzle**
7		**Back cap**

5.5 Convert welding torch

5.5.1 Standard version delivery state

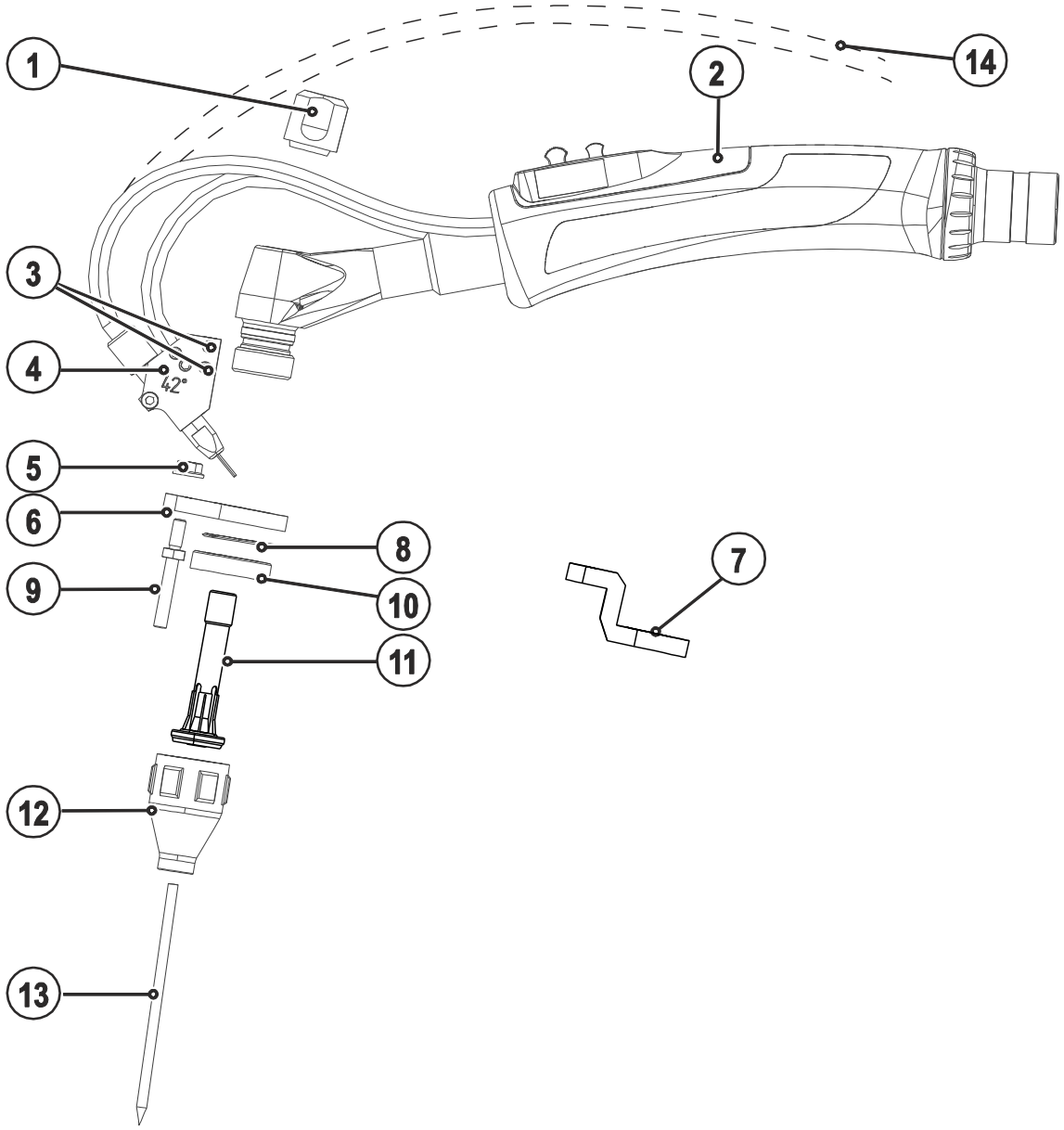


Figure 5-4

Item	Symbol	Description
1		Back cap
2		Torch body
3		Allen screw
4		Filler wire guide
5		Hexagon nut
6		Support plate - TIG 200 / 450 version
7		Support plate - TIG 260 version
8		O-ring
9		Stud bolts, M4 x 10 SW7 L26 MM, - L36 MM, - L41 MM
10		Plastic insulation
11		Gas diffuser
12		Gas nozzle
13		Tungsten electrode
14		Filler wire guide - WO version

- Unscrew back cap and remove electrode.
- Loosen the hexagonal socket screw of the filler wire guide and remove the filler wire guide from the stud bolt.
- Unscrew the gas nozzle and remove the gas diffuser from the torch body.
- Loosen the stud bolt nut and unscrew the stud bolt from the support plate.
- Unscrew the insulation and support plate from the torch body.

5.5.2 Converting to jumbo version

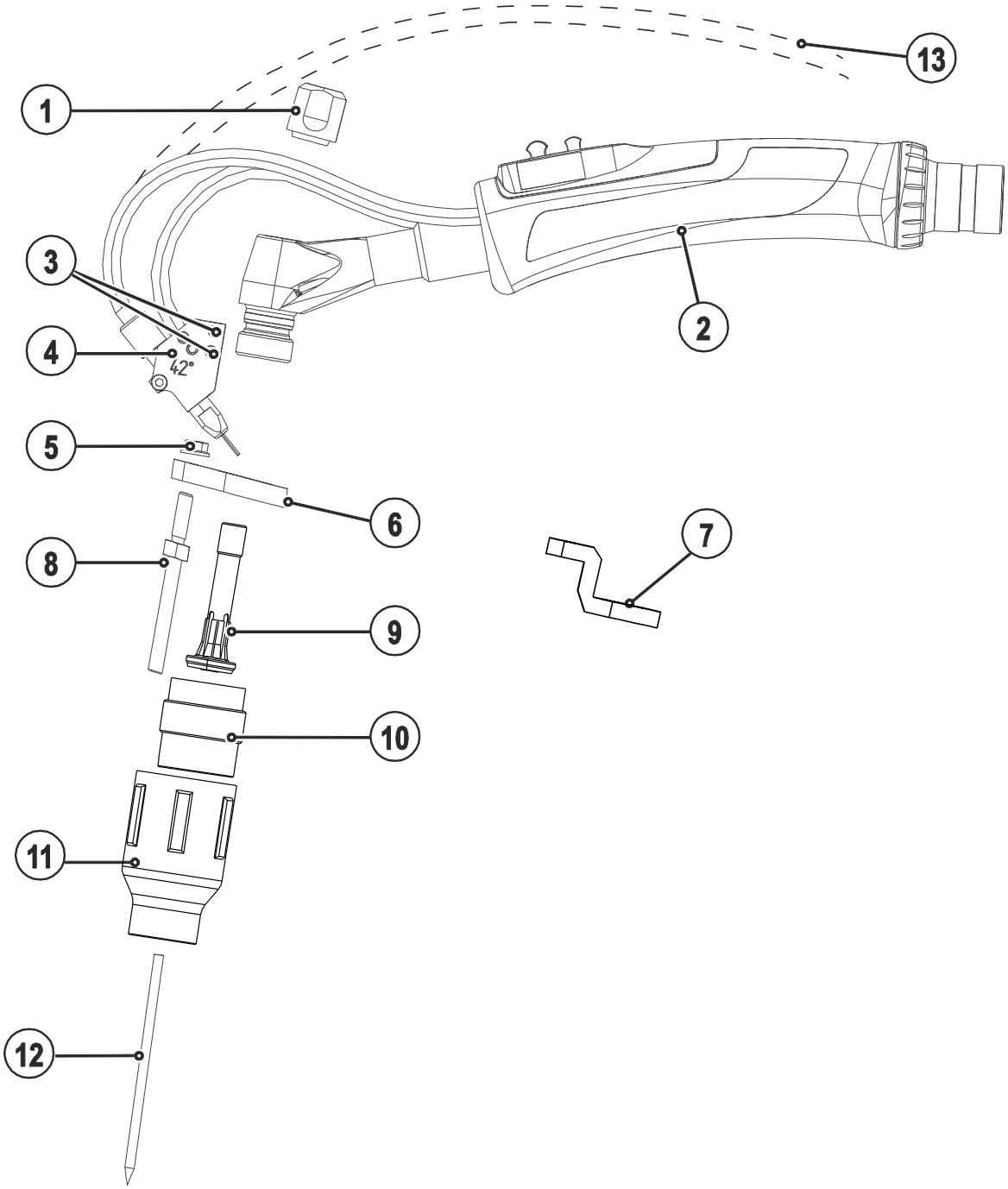


Figure 5-5

Item	Symbol	Description
1		Back cap
2		Torch body
3		Allen screw
4		Filler wire guide
5		Hexagon nut
6		Support plate - TIG 200 / 450 version
7		Support plate - TIG 260 version
8		Stud bolt, M4X15 L56MM SW7
9		Gas diffuser
10		Gas diffuser for jumbo version
11		Gas nozzle for jumbo version
12		Tungsten electrode
13		Filler wire guide - WO version

- Screw the jumbo gas nozzle bracket with the plane side onto the torch body.
- Insert the gas diffuser into the torch body.
- Screw the jumbo gas nozzle gas diffuser onto the torch body.
- Screw the jumbo gas nozzle stud bolts into the jumbo gas nozzle bracket and secure with the nut.
- Screw the jumbo gas nozzle onto the torch body.
- Plug the filler wire guide onto the stud bolt and secure with the hexagonal socket screws.
- Insert the electrode into the torch body and secure with the back cap.

5.5.3 Converting to bottle neck

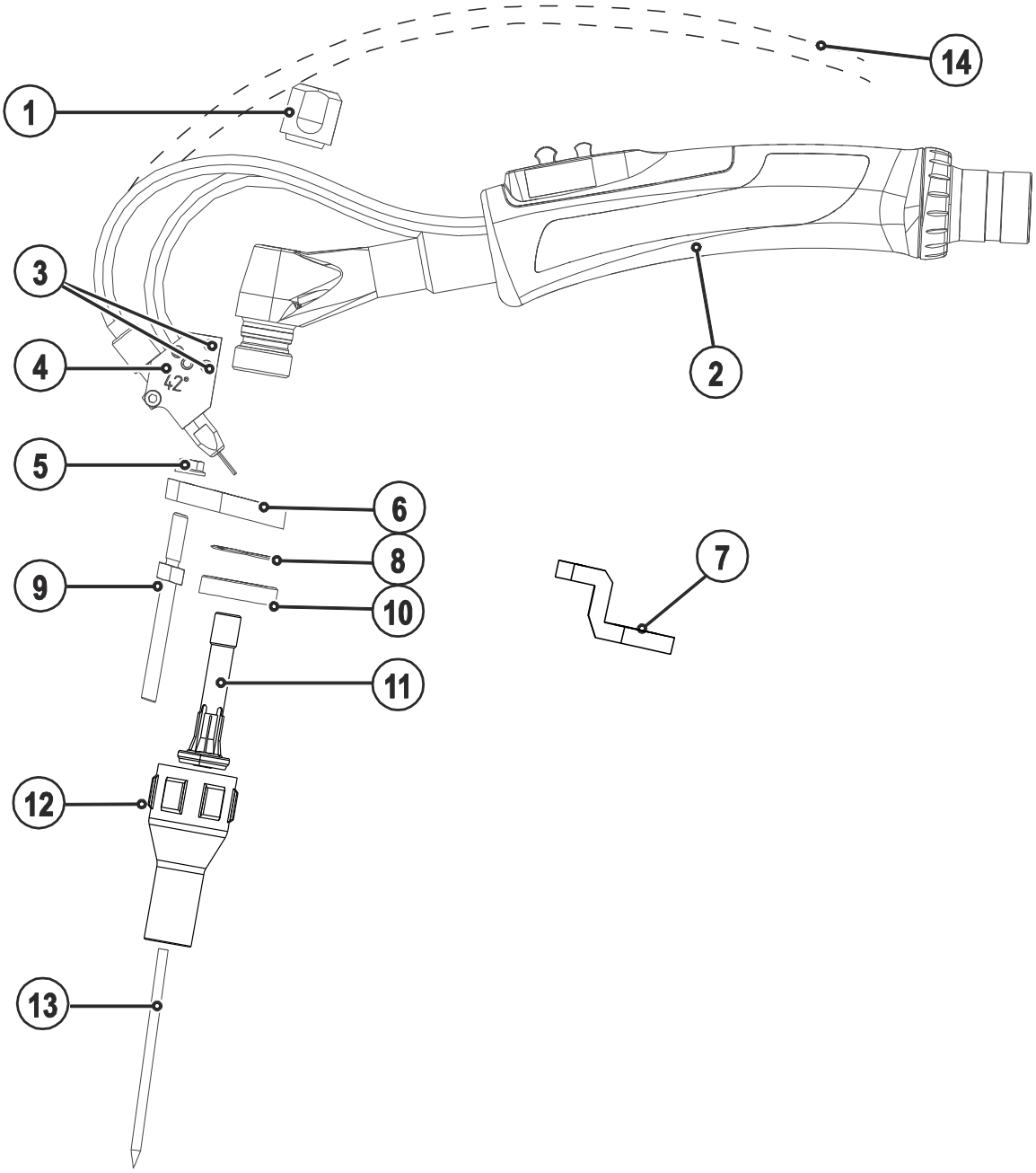


Figure 5-6

Item	Symbol	Description
1		Back cap
2		Torch body
3		Allen screw
4		Filler wire guide
5		Hexagon nut
6		Support plate - TIG 200 / 450 version
7		Support plate - TIG 260 version
8		O-ring
9		Stud bolt, M4X10 L44MM SW7
10		Plastic insulation
11		Gas diffuser
12		Gas nozzle
13		Tungsten electrode
14		Filler wire guide - WO version

- Insert the o-ring into the bracket and plug the bracket with the plane side onto the torch body.
- Screw the insulator with the plane side onto the torch body.
- Screw the stud bolt into the bracket and secure with the nut.
- Insert the gas diffuser into the torch body.
- Screw the gas nozzle onto the torch body.
- Plug the filler wire guide onto the stud bolt and secure with the hexagonal socket screws.
- Insert the electrode into the torch body and secure with the back cap.

5.6 Assemble the wire guide

Depending on the wire electrode diameter or type, either a steel liner or liner with the correct inner diameter must be inserted in the torch!

Recommendation:

- Use a steel liner when welding hard, unalloyed wire electrodes (steel).
- Use a chrome nickel liner when welding hard, high-alloy wire electrodes (CrNi).
- Use a plastic or teflon liner when welding or brazing soft wire electrodes, high-alloy wire electrodes or aluminium materials.

☞ ***Always make sure the the hose package is straight when replacing the wire guide.***

☞ ***The welding torch shown is an example only. Depending on the type used, torches may vary.***

5.6.1 Replace steel liner

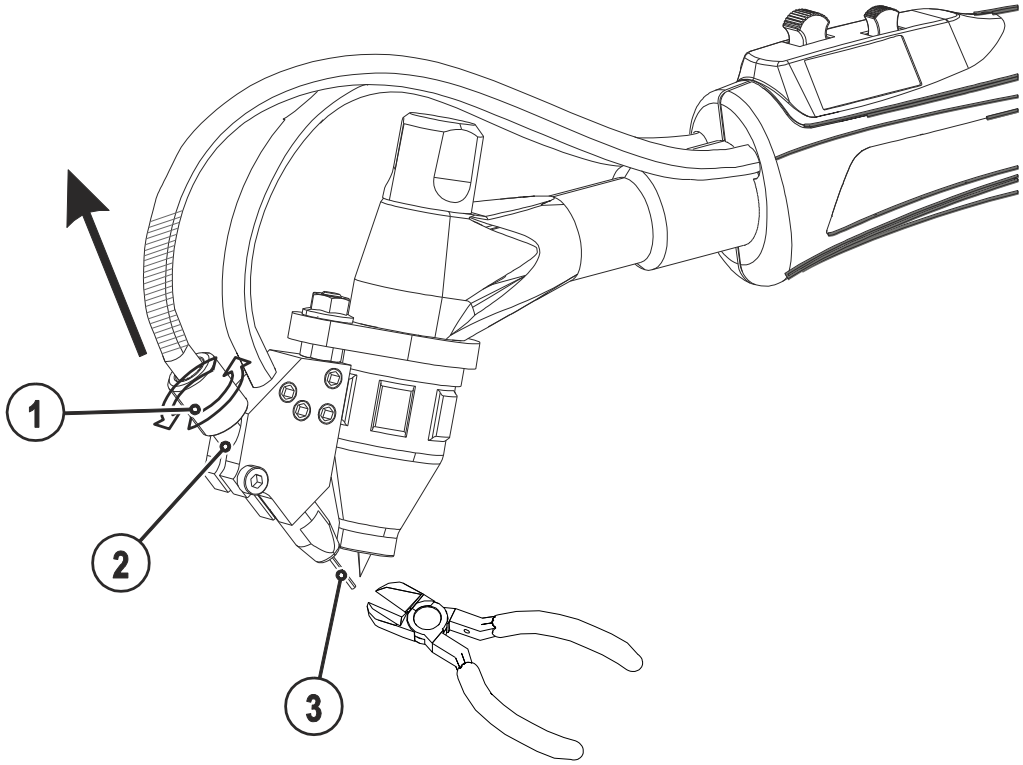


Figure 5-7

Item	Symbol	Description
1		**Crown nut**
2		**Connecting sleeve**
3		**Welding wire**
4		**Collet chuck**
5		**Insulation piece**
6		**Steel liner**
7		**Wire feed tube**
8		**New steel liner**
9		**Wire feed nipple**

- Cut off the welding wire tip.
- Loosen the crown nut of the jointing sleeve.
- Pull out steel liner
- Remove the welding wire up to the wire feeding from the steel liner.

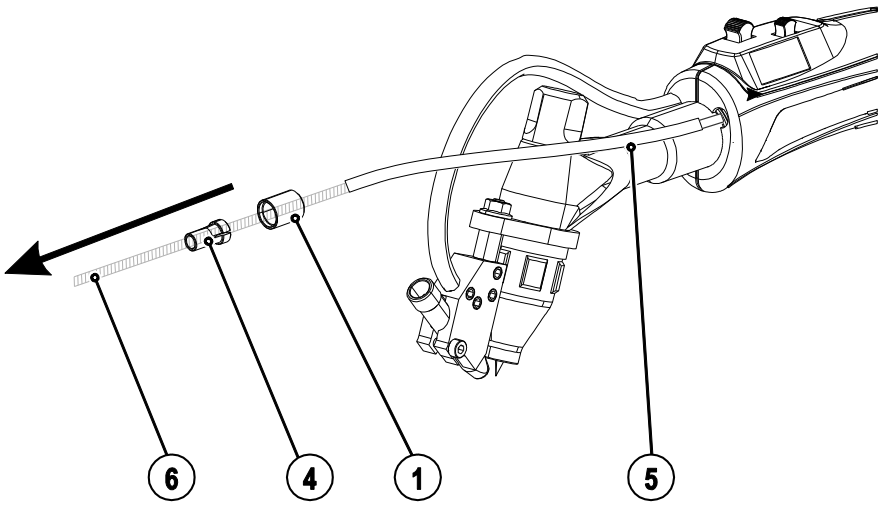


Figure 5-8

- Remove the crown nut, collet chuck and insulating tube from the steel liner.

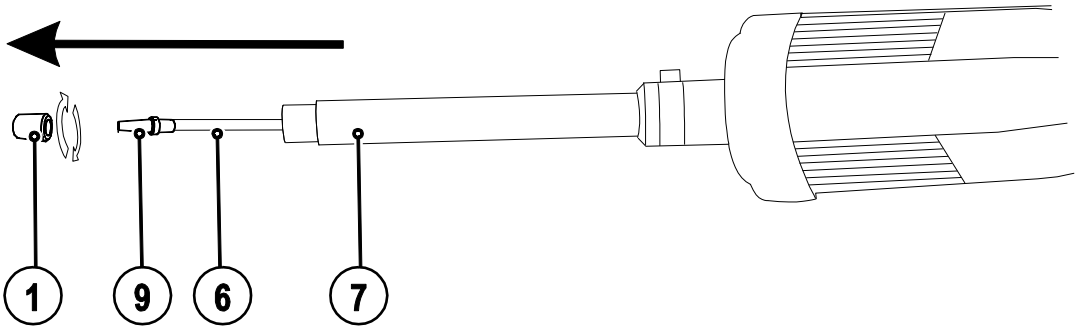


Figure 5-9

- Disconnect the torch connector from the wire feeding.
- Unscrew the crown nut from the inlet tube.
- Extend and lay out the torch hose package.
- Pull out steel liner

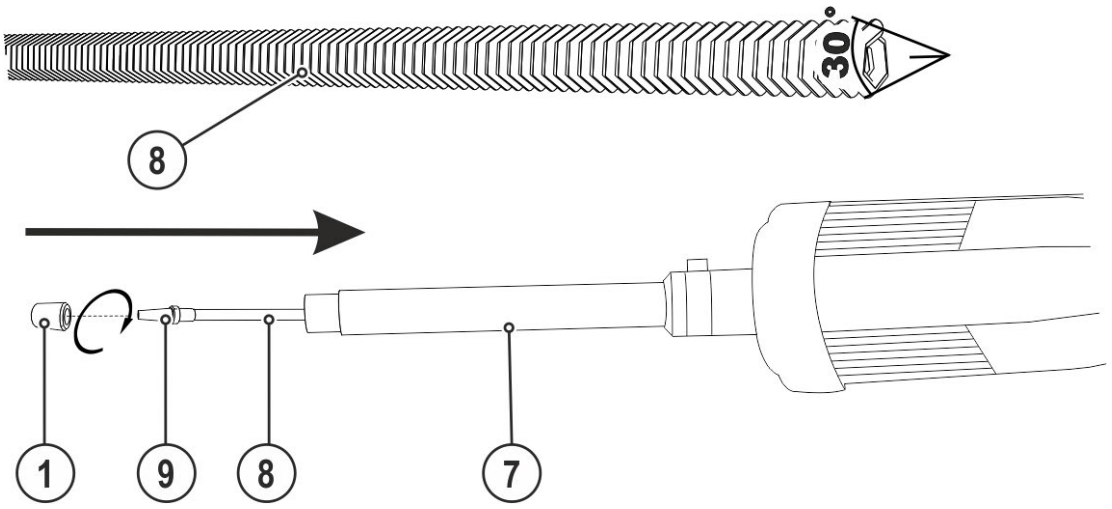


Figure 5-10

- Chamfer the steel liner on one side at 30°.
- Screw a suitable inlet guide tightly to the new steel liner on the side that is not chamfered, if necessary.
- Blow out the new steel liner with shielding gas or water- and oil-free compressed air.
- Insert the new steel liner with the chamfered side into the inlet tube and push through with slight pressure.
- Tighten the crown nut by hand.

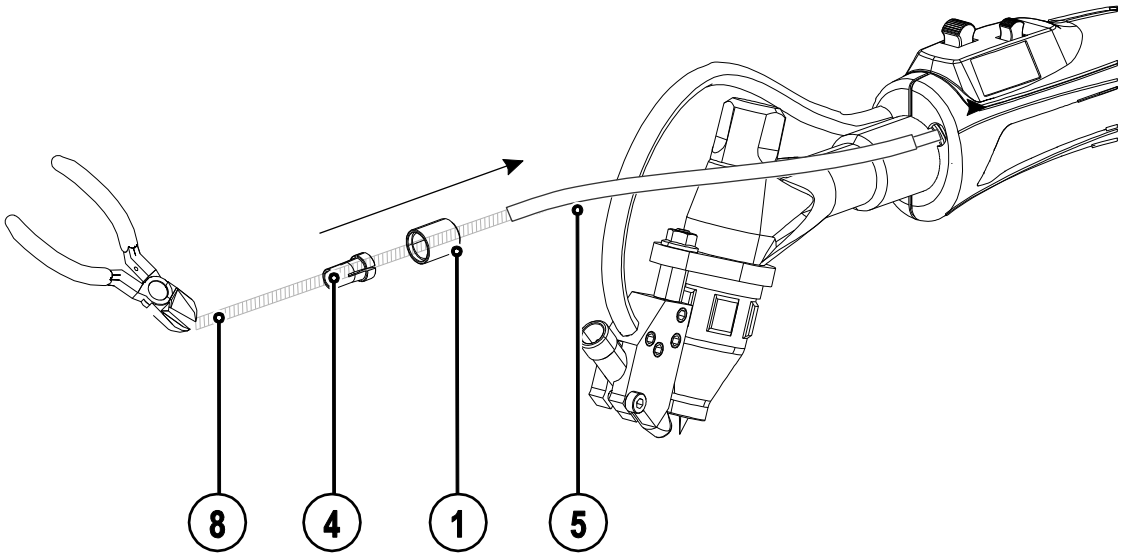


Figure 5-11

- Cut off the new steel liner so that it has a length of at least 250 mm.
- Plug the insulating tube onto the new steel liner.
- Plug the crown nut onto the new steel liner.
- Screw the collet chuck onto the new steel liner until the new steel liner protrudes 7 mm.

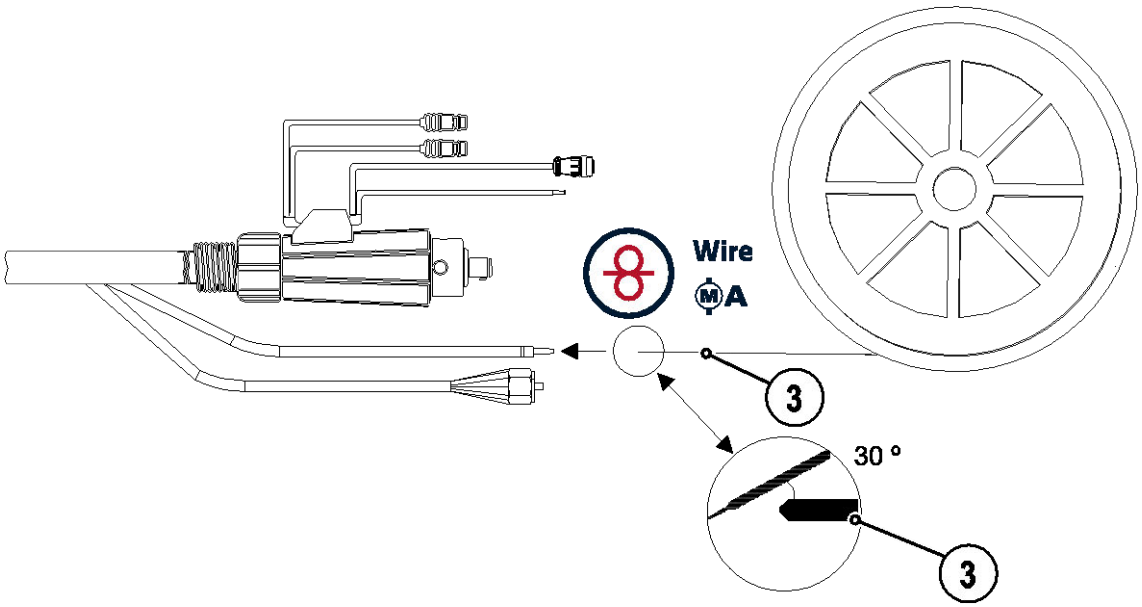


Figure 5-12

- Chamfer the welding wire at 30° before inserting into the new steel liner.
- Connect the torch connector to the wire feeding (see chapter "Connecting the welding torch").

> see 5.3 chapter

- Using the wire feeding, insert the welding wire into the new steel liner until it protrudes 40 mm at the end of the steel liner.

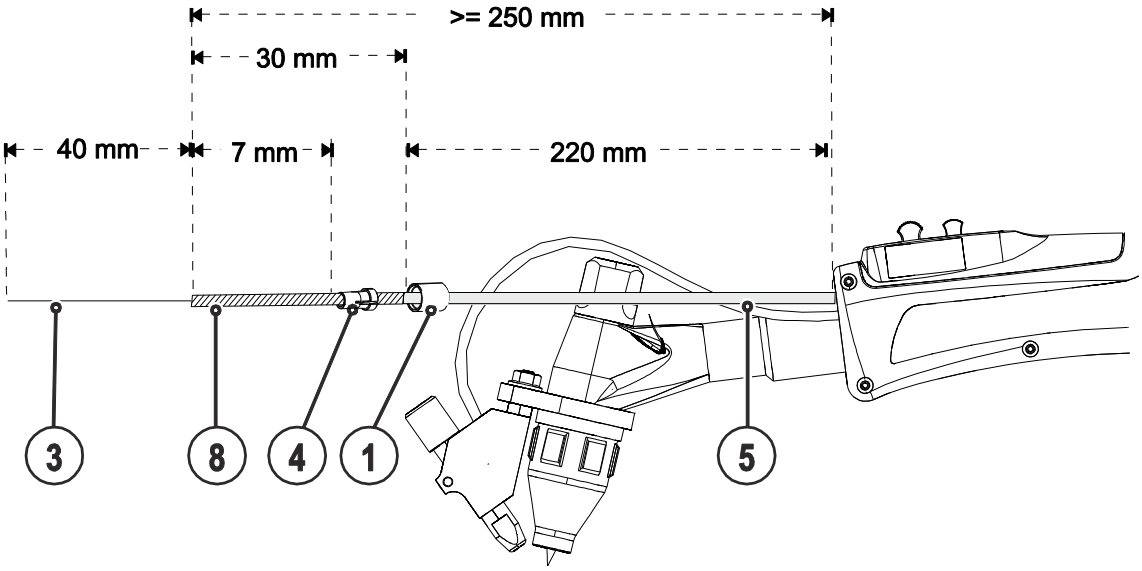


Figure 5-13

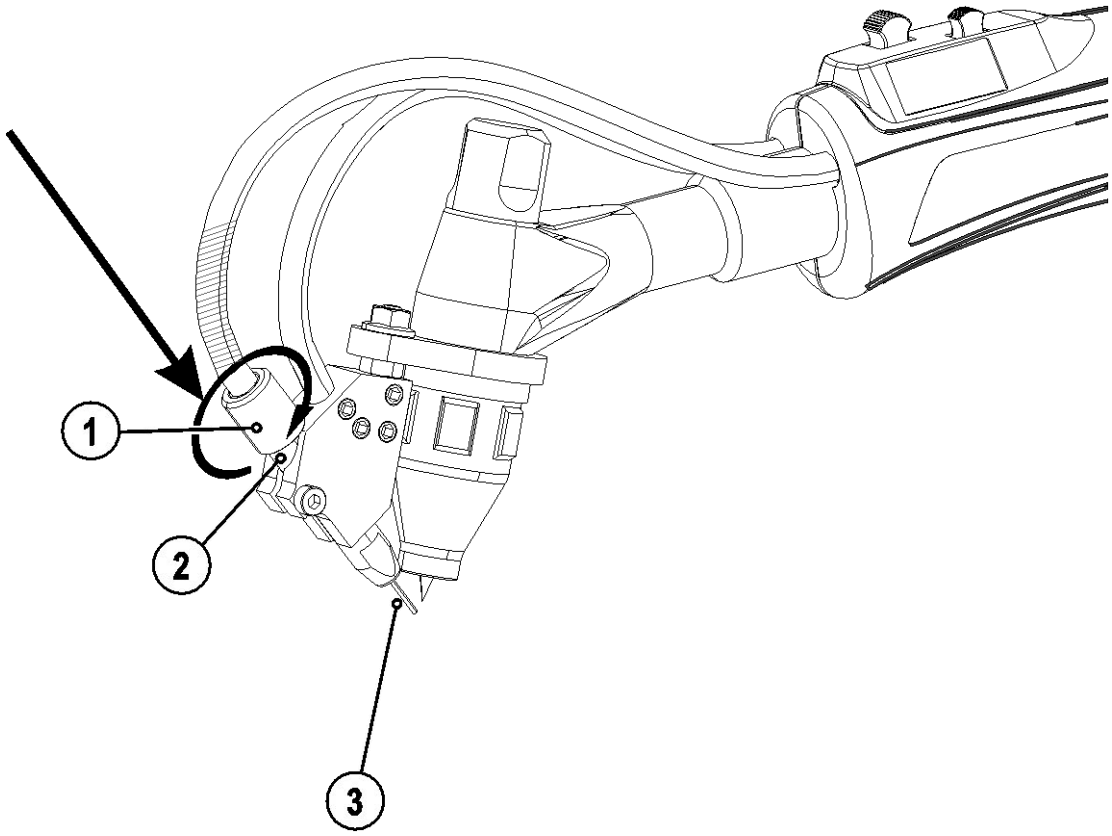


Figure 5-14

- Insert the new steel liner into the jointing sleeve as far as it goes.
- Tighten the crown nut by hand.

5.6.2 Plastic liner

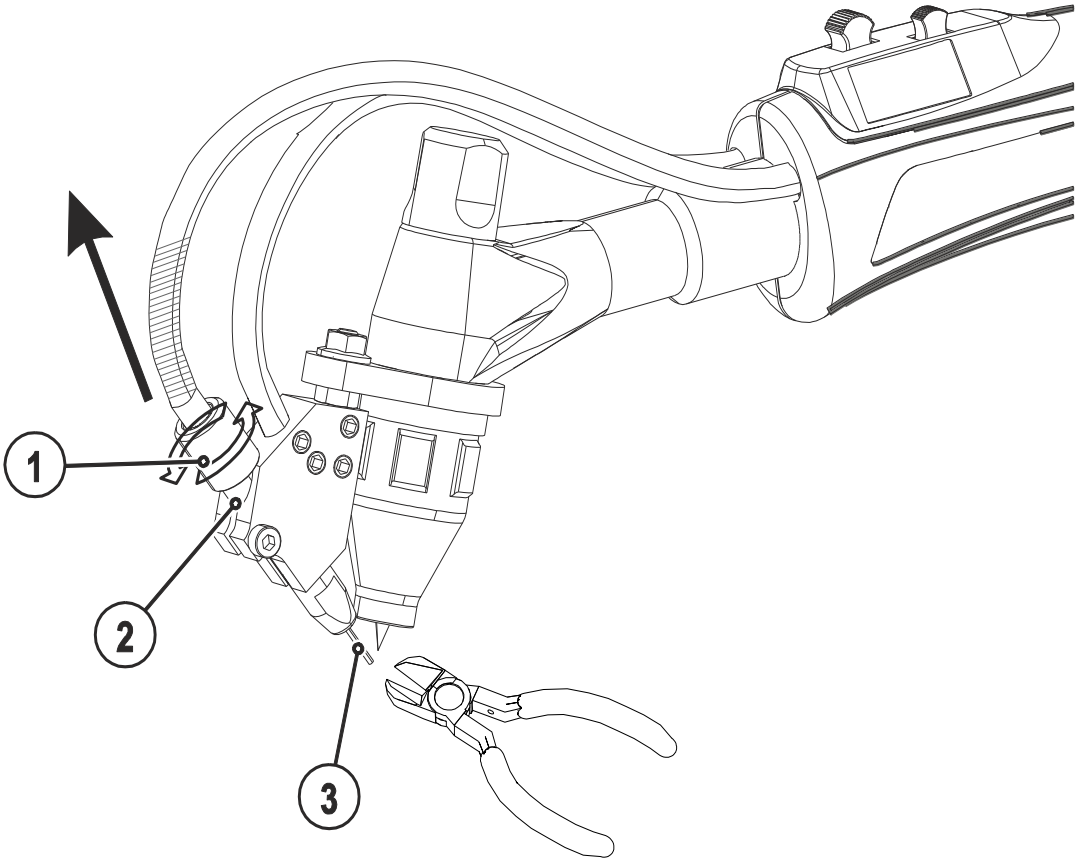


Figure 5-15

Item	Symbol	Description
1		Crown nut
2		Connecting sleeve
3		Welding wire
4		Collet chuck
5		Insulation piece
6		Combined liner
7		Wire feed tube
8		New combined liner
9		Wire feed nipple

- Loosen the crown nut of the jointing sleeve.
- Cut off the welding wire tip.
- Remove the combined liner from the jointing sleeve.
- Remove the welding wire completely from the torch hose package.

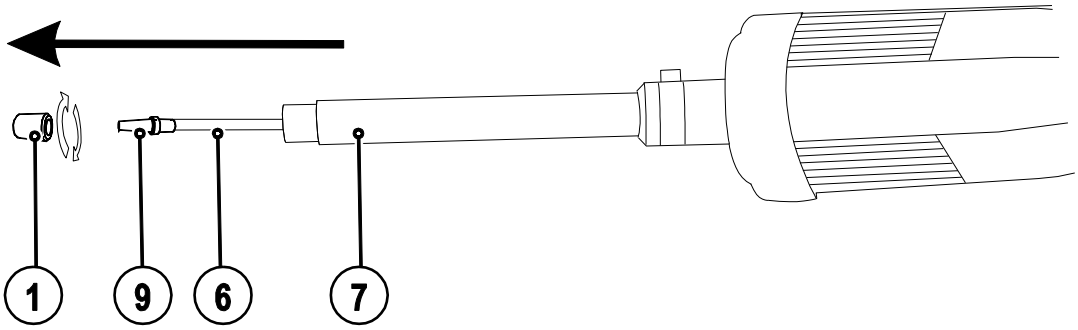


Figure 5-16

- Disconnect the torch connector from the wire feeding.
- Unscrew the crown nut from the inlet tube.
- Remove existing wire feed nipple.

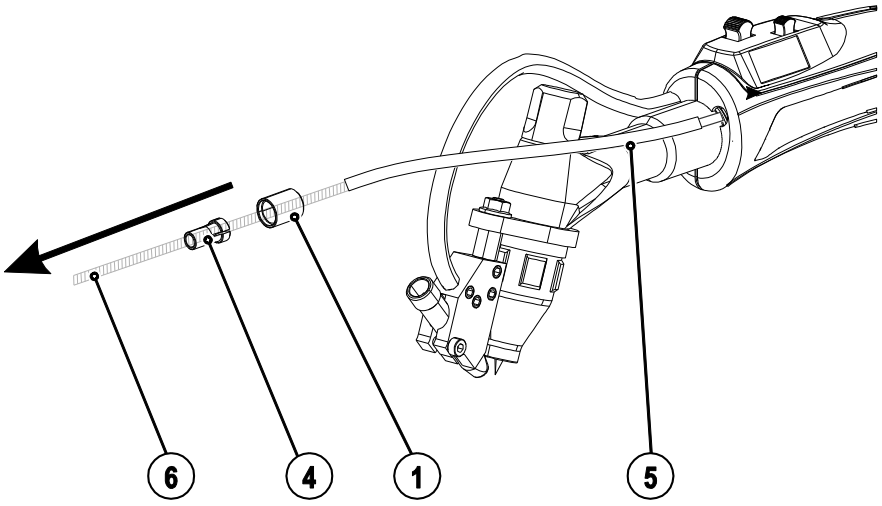


Figure 5-17

- Remove the crown nut, collet chuck and insulating tube from the combined liner.
- Extend and lay out the torch hose package.
- Remove the combined liner completely from the torch hose package.

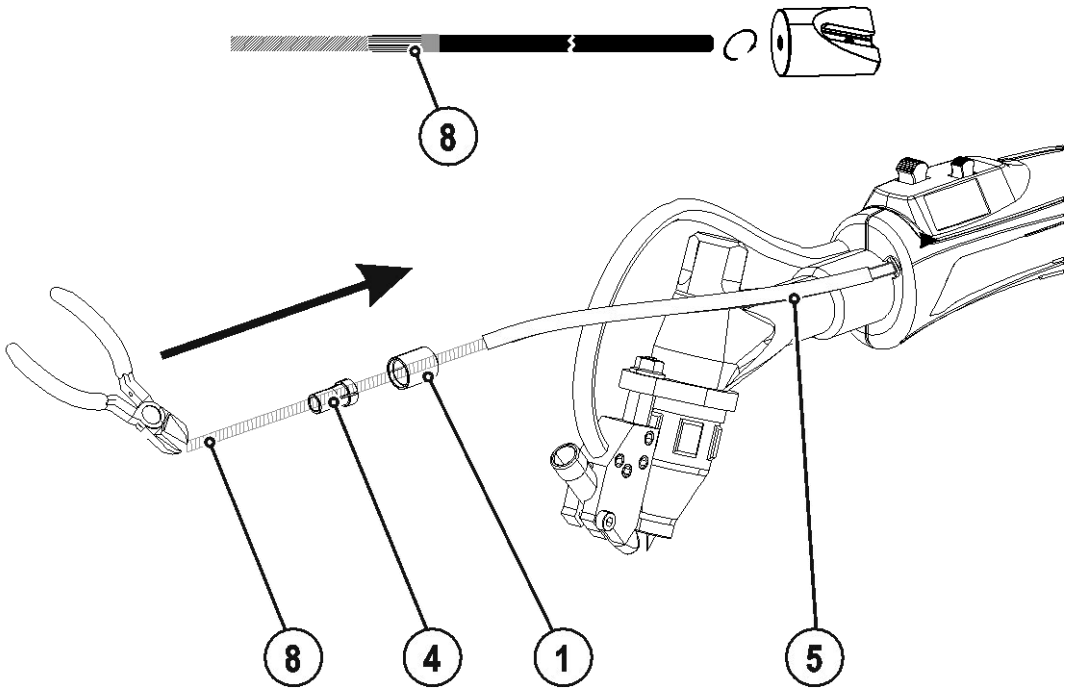


Figure 5-18

- Sharpen the new combined liner with a liner sharpener.
- Cut off the new combined liner to a length of at least 250 mm.
- Push the new combined liner through the welding torch and the torch hose package as far as it goes.
- Plug the insulating tube and crown nut onto the new combined liner.
- Screw the collet chuck onto the new combined liner until the new combined liner protrudes 7 mm.

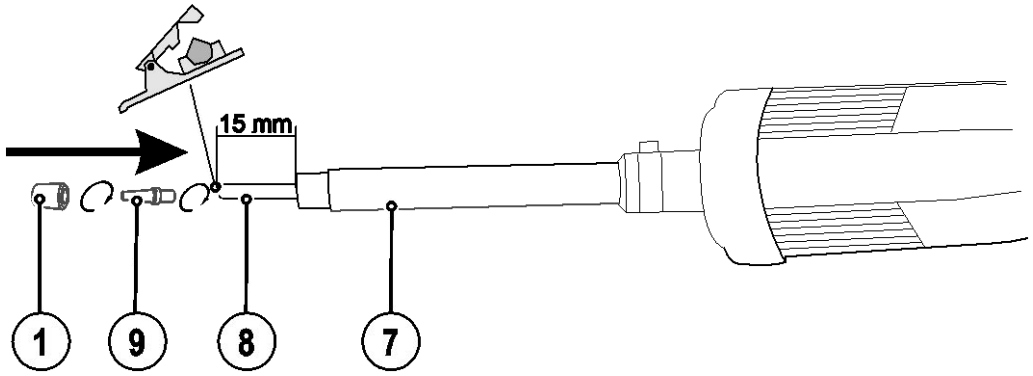


Figure 5-19

- Cut off the new combined liner with a tube cutter to a length of 15 mm.
- Manually screw the inlet guide onto the new combined liner.
- Plug the crown nut onto the inlet guide and manually screw to the inlet tube.
- Blow out the new combined liner with shielding gas or water- and oil-free compressed air.

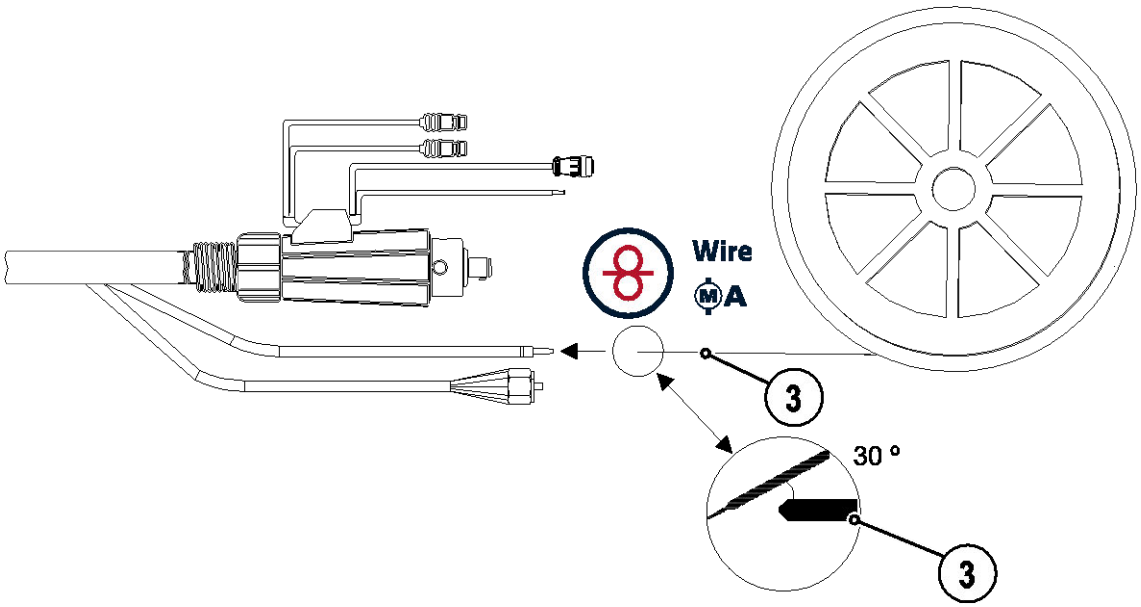


Figure 5-20

- Chamfer the welding wire at 30° before inserting into the new combined liner.
- Connect the torch connector to the wire feeding (see chapter "Connecting the welding torch").

> see 5.3 chapter

- Using the wire feeding, insert the welding wire into the new combined liner until it protrudes at the welding torch.

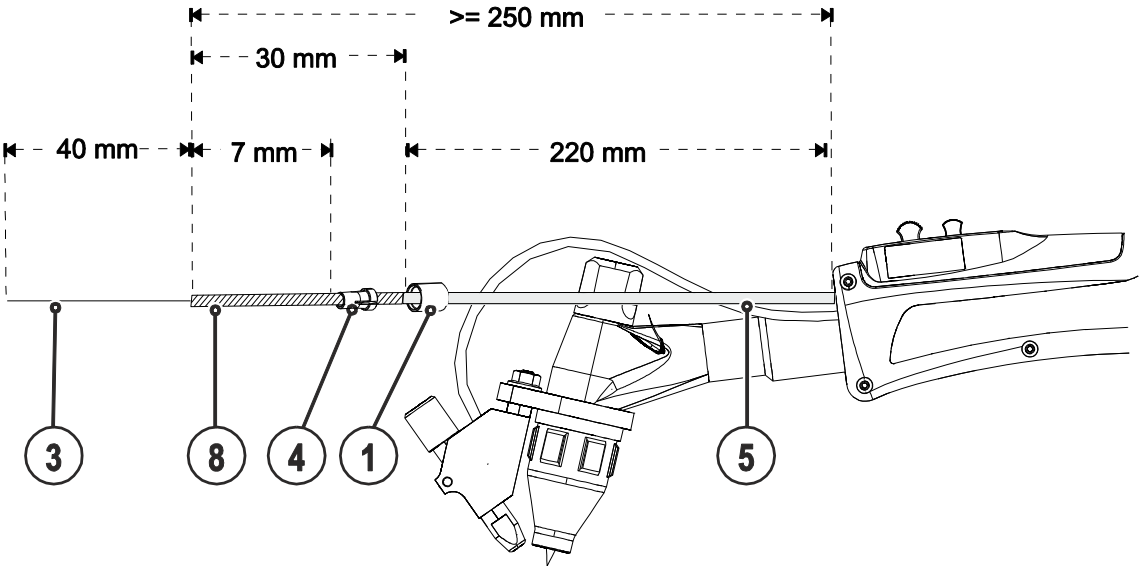


Figure 5-21

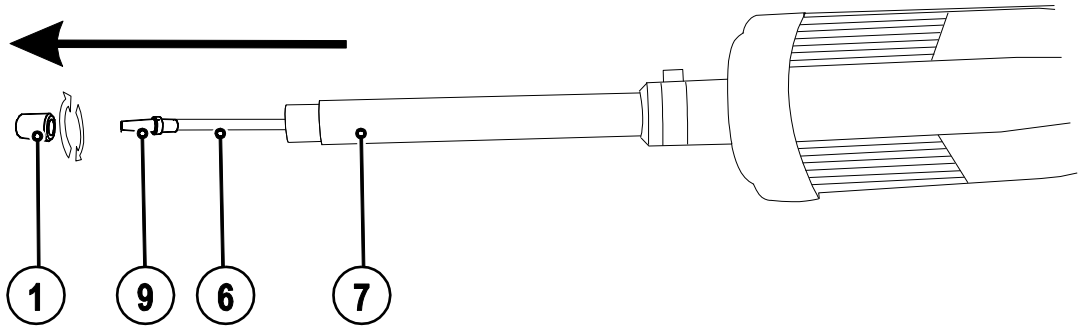


Figure 5-22

- Insert the new combined liner into the jointing sleeve as far as it goes.
- Tighten the crown nut by hand.
- Cut off the welding wire tip.

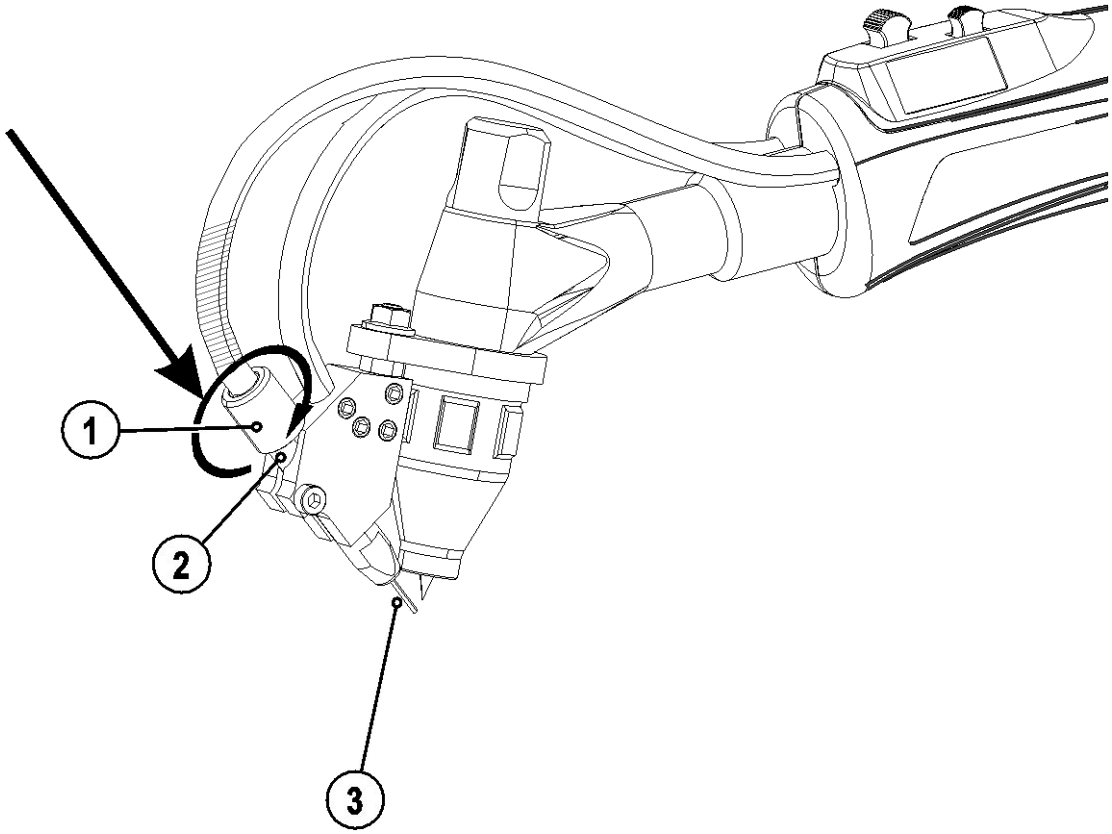


Figure 5-23

- Insert the new combined liner into the jointing sleeve as far as it goes.
- Tighten the crown nut by hand.

5.7 Configuring the welding machine for mechanical arc fusion welding

The welding machine must be configured before commissioning for the first time for mechanical arc fusion welding (cold or hot wire welding). The basic settings are configured directly at the welding machine control.

1. Cold or hot wire welding process (Hotwire = on/off)
2. Forward/backward motion selection (Freq = on/off)

In addition, the wire return can be adjusted if necessary.

5.7.1 Operating modes (functional sequences)

☞ ***Torch trigger 1 (BRT 1) switches the welding current on or off.***
Torch trigger 2 (BRT 2) switches the wire feeding on or off.
In addition, you can inch the wire by pressing torch trigger 2 (BRT 2) or reverse inch the wire by tapping it.
You can choose between four operating modes (see the following functional sequences). Wire feeding is infinitely adjustable by means of torch triggers 3 and 4 (BRT 3 and BRT 4).

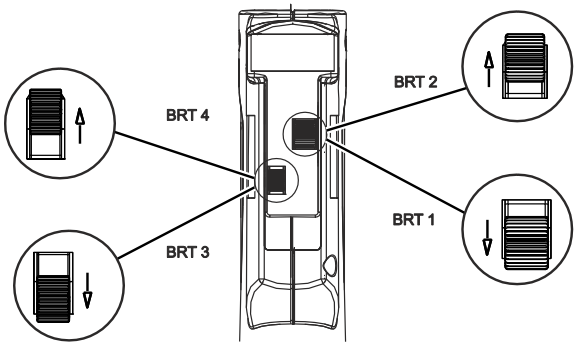


Figure 5-24

5.7.1.1 Explanation of symbols

Symbol	Meaning
	Press torch trigger
	Release torch trigger
	Tap torch trigger (quick pressing and releasing)
	Shielding gas flowing
I	Welding performance
	Non-latched, manual
	Latched, manual
	Non-latched automatic
	Latched automatic
t	Time
P_{START}	Start program
P_A	Main program
P_B	Reduced main program
P_{END}	End program
	Wire feeding

5.7.1.2 Non-latched Manual

☞ ***The welding machine has to be set to a latched operating mode.***

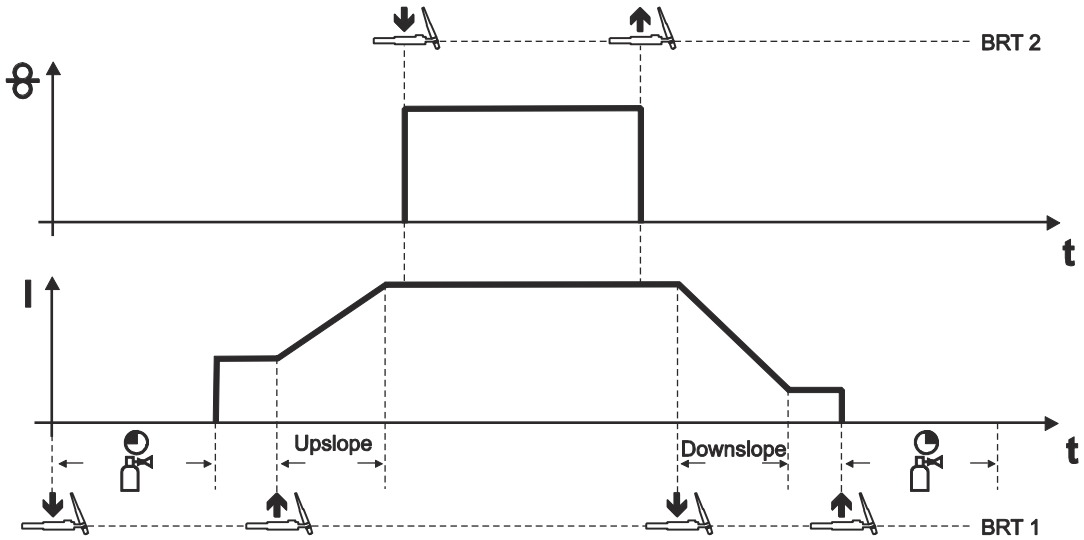


Figure 5-25

First cycle (current)

- Press torch trigger 1 (BRT 1), the gas pre-flow time elapses.
- HF ignition pulses jump from the tungsten electrode to the workpiece. The arc ignites.
- Welding current flows.

Second cycle (current)

- BRT 1 Release .
- The welding current ramps up to the main current AMP in the selected up-slope time.

First cycle (wire)

- Press torch trigger 2 (BRT 2).
  Wire electrode is fed.

Second cycle (wire)

- BRT 2 Release .
  Wire electrode feeding is stopped, wire electrode is returned by the set wire return value.

Third cycle (current)

- BRT 1 Press .
- The main current is reduced in the selected down-slope time.

Fourth cycle (current)

- BRT 1 Release , the arc extinguishes.
- Shielding gas continues to flow in the selected gas post-flow time.

5.7.1.3 Latched manual

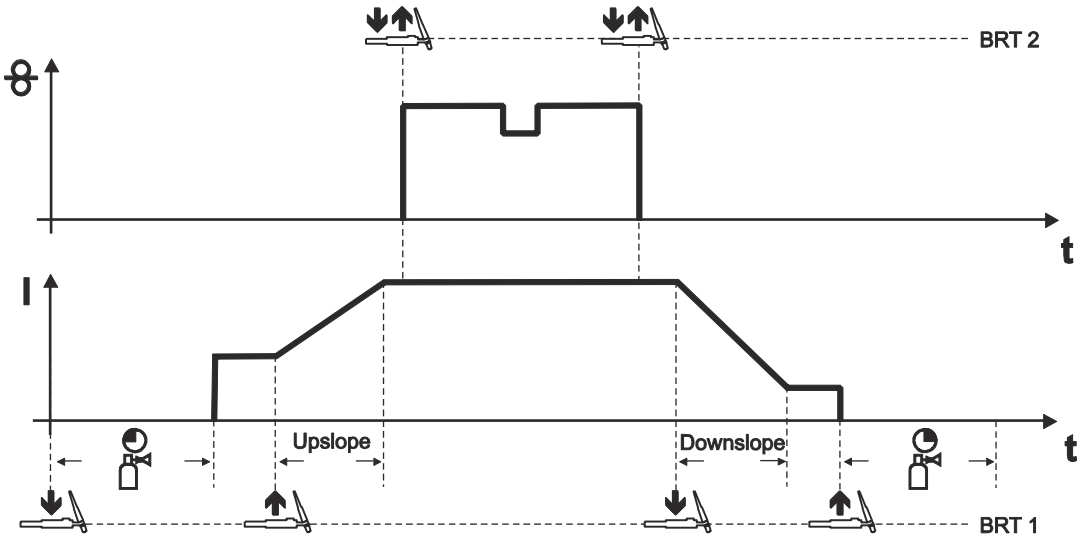


Figure 5-26

This operating mode differs from non-latched operation in the following ways:

- Wire feeding is started by pressing and releasing (tapping) BRT 2.
- By tapping you can switch to the reduced wire feeding.
- By pressing and releasing (tapping) BRT 2 again, wire feeding will stop. (It is not necessary to keep the torch trigger pressed. This is especially helpful with long welding seams.)

Stopping the welding process:

- Keep BRT 1 pressed for a period longer than the set tapping time.

☞ ***Swiftly tap the torch trigger to change the function.***
The tapping time set determines the functionality of the tapping function.

5.7.1.4 Non-latched automatic

☞ ***The welding current has to be set to a non-latched operating mode at the welding machine.***

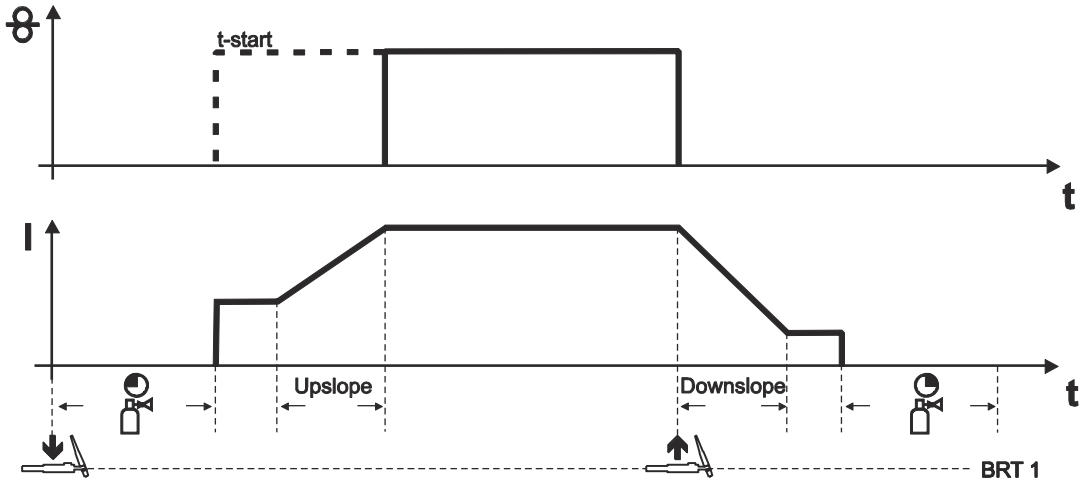


Figure 5-27

First cycle (current)

- Press torch trigger 1 (BRT 1) and keep pressed.
- The gas pre-flow time elapses.
- HF ignition pulses jump from the electrode to the workpiece. The arc ignites.
- The welding current flows and immediately assumes the value of the starting current I_{start}.
- HF switches off.
- The welding current increases in the set up-slope time to the main current AMP.
- The wire electrode is fed once the delay time (t-start) has elapsed.

Second cycle (current)

- Release BRT 1.
- Wire electrode feeding is stopped, wire electrode is returned by the set wire return value.
- The main current is reduced in the selected down-slope time, the arc is extinguished.
- Shielding gas continues to flow in the selected gas post-flow time.

5.7.1.5 Latched automatic

☞ ***The welding machine has to be set to a latched operating mode.***

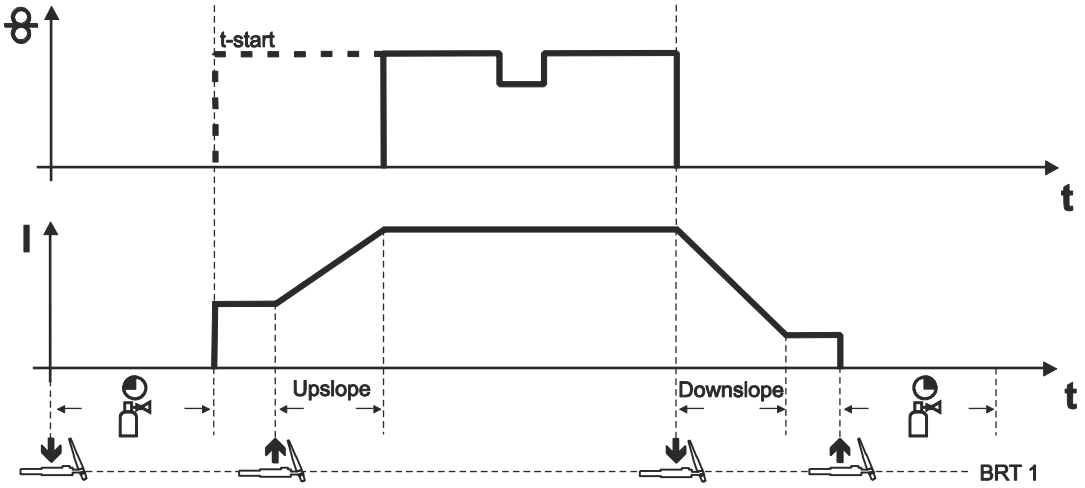


Figure 5-28

1. cycle (current)
- Press torch trigger 1 (BRT 1), the gas pre-flow time elapses.
- HF ignition pulses jump from the tungsten electrode to the workpiece. The arc ignites.
- Welding current flows.

2. cycle (current)

Release BRT 1.
- The welding current ramps up to the main current AMP in the selected up-slope time.

1. cycle (wire)
- The wire electrode is fed once the delay time (t-start) has elapsed.

3. cycle (current)
- Press BRT 1.
- The main current is reduced in the selected down-slope time.

2. cycle (wire)
- Wire electrode feeding is stopped, wire electrode is returned by the set wire return value.

4. cycle (current)
- Release BRT 1, the arc extinguishes.
- Shielding gas continues to flow in the selected gas post-flow time.
- By tapping you can switch to the reduced wire feeding.
- By pressing and releasing (tapping) BRT 1 again, wire feeding will stop. (It is not necessary to keep the torch trigger pressed. This is especially helpful with long welding seams.)

Stopping the welding process:
- Keep BRT 1 pressed for a period longer than the set tapping time.

5.7.1.6 TIG tacking

☞ ***The welding current has to be set to a non-latched operating mode at the welding machine.***

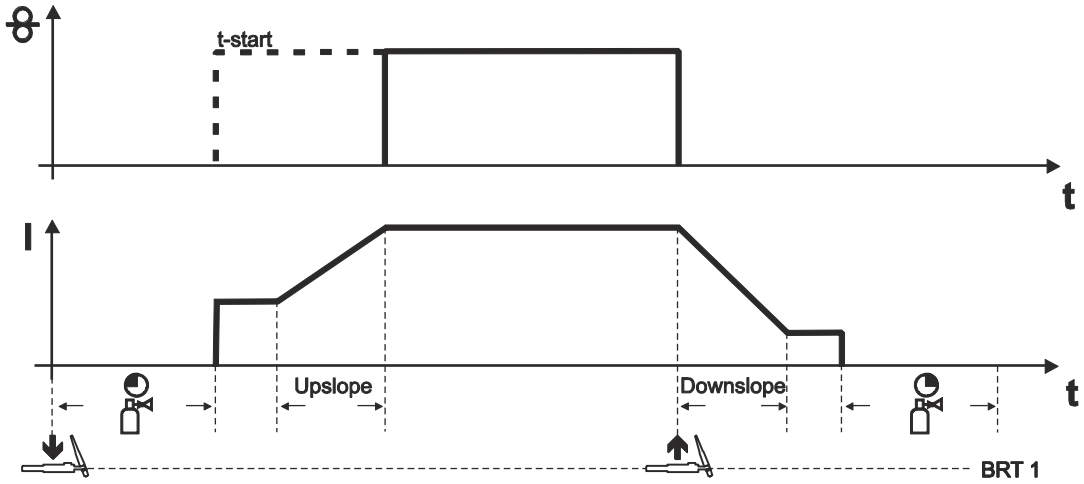


Figure 5-29

Sequence:

- Press torch trigger 1 (BRT 1) and keep pressed.
- The gas pre-flow time elapses.
- HF ignition pulses jump from the electrode to the workpiece. The arc ignites.
- The welding current flows and immediately assumes the value of the starting current I_{start}.
- HF switches off.
- The welding current increases in the set up-slope time to the main current AMP.
- The wire electrode is fed once the delay time (t-start) has elapsed.
- Release BRT 1.
- Wire electrode feeding is stopped, wire electrode is returned by the set wire return value.
- The main current is reduced in the selected down-slope time, the arc is extinguished.
- Shielding gas continues to flow in the selected gas post-flow time.

5.7.1.7 superPuls

☞ ***The two functions superPuls and superimposed forward/backward motion of the wire can not be used simultaneously.***

The EWM superPuls function enables automatic switching between two operating points in a process.

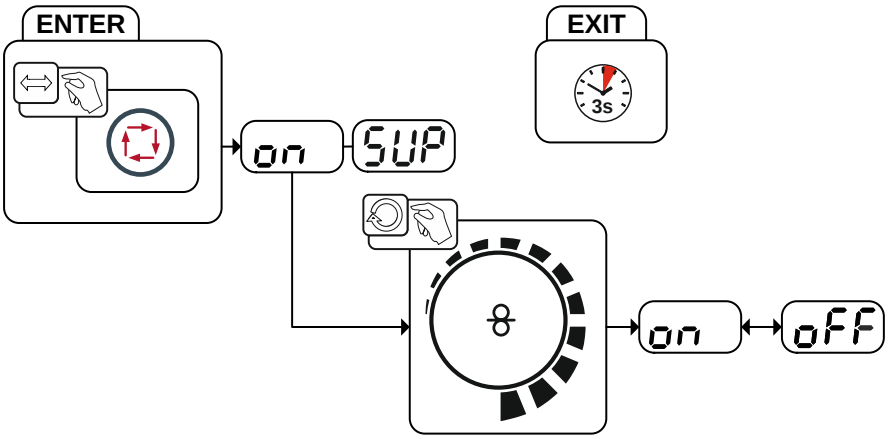


Figure 5-30

Display	Setting/selection
on	**Switch on** Switching on machine function
SUP	**Selects superPuls** Switches function on or off.
oFF	**Switch off** Switching off machine function

6 Maintenance, care and disposal

6.1 General

⚠ DANGER

Risk of injury due to electrical voltage after switching off!
Working on an open machine can lead to fatal injuries!
Capacitors are loaded with electrical voltage during operation. Voltage remains present for up to four minutes after the mains plug is removed.

1. Switch off machine.
2. Remove the mains plug.
3. Wait for at last 4 minutes until the capacitors have discharged!

⚠ WARNING

Incorrect maintenance, testing and repair!
Maintenance, testing and repair of the machine may only be carried out by skilled and qualified personnel. A qualified person is one who, because of his or her training, knowledge and experience, is able to recognise the dangers that can occur while testing welding power sources as well as possible subsequent damage, and who is able to implement the required safety procedures.

Observe the maintenance instructions > *see 6.3 chapter*.

- In the event that the provisions of one of the below-stated tests are not met, the machine must not be operated again until it has been repaired and a new test has been carried out!

Repair and maintenance work may only be performed by qualified authorised personnel; otherwise the right to claim under warranty is void. In all service matters, always consult the dealer who supplied the machine. Return deliveries of defective equipment subject to warranty may only be made through your dealer. When replacing parts, use only original spare parts. When ordering spare parts, please quote the machine type, serial number and item number of the machine, as well as the type designation and item number of the spare part.

Under the specified ambient conditions and normal working conditions this machine is essentially maintenance-free and requires just a minimum of care.

Contamination of the machine may impair service life and duty cycle. The cleaning intervals depend on the ambient conditions and the resulting contamination of the machine. The minimum interval is every six months.

6.2 Cleaning

- Clean the outer surfaces with a moist cloth (no aggressive cleaning agents).
- Purge the machine venting channel and cooling fins (if present) with oil- and water-free compressed air. Compressed air may overspeed and destroy the machine fans. Never direct the compressed air directly at the machine fans. Mechanically block the fans, if required.
- Check the coolant for contaminants and replace, if necessary.

6.2.1 Dirt filter

The duty cycle of the welding machine decreases as an effect of the reduced cooling air volume. Depending on the amount of dirt building up (at least every two months), the dirt filter has to be uninstalled and cleaned regularly (e.g. by purging with compressed air).

6.3 Maintenance work, intervals

6.3.1 Daily maintenance tasks

Visual inspection

- Mains supply lead and its strain relief
- Gas cylinder securing elements
- Check hose package and power connections for exterior damage and replace or have repaired by specialist staff as necessary!
- Gas tubes and their switching equipment (solenoid valve)
- Check that all connections and wearing parts are hand-tight and tighten if necessary.
- Check correct mounting of the wire spool.
- Wheels and their securing elements
- Transport elements (strap, lifting lugs, handle)
- Other, general condition

Functional test

- Operating, message, safety and adjustment devices (Functional test)
- Welding current cables (check that they are fitted correctly and secured)
- Gas tubes and their switching equipment (solenoid valve)
- Gas cylinder securing elements
- Check correct mounting of the wire spool.
- Check that all screw and plug connections and replaceable parts are secured correctly, tighten if necessary.
- Remove any spatter.
- Clean the wire feed rollers on a regular basis (depending on the degree of soiling).

6.3.2 Monthly maintenance tasks

Visual inspection

- Casing damage (front, rear and side walls)
- Wheels and their securing elements
- Transport elements (strap, lifting lugs, handle)
- Check coolant tubes and their connections for impurities

Functional test

- Selector switches, command devices, emergency stop devices, voltage reducing devices, message and control lamps
- Check that the wire guide elements (inlet nipple, wire guide tube) are fitted securely.
- Check coolant tubes and their connections for impurities
- Check and clean the welding torch. Deposits in the torch can cause short circuits and have a negative impact on the welding result, ultimately causing damage to the torch.

6.3.3 Annual test (inspection and testing during operation)

A periodic test according to IEC 60974-4 "Periodic inspection and test" has to be carried out. In addition to the regulations on testing given here, the relevant local laws and regulations must also be observed.

☞ ***For more information refer to the "Warranty registration" brochure supplied and our information regarding warranty, maintenance and testing at www.ewm-group.com!***

6.4 Disposing of equipment

☞ ***Proper disposal!***

The machine contains valuable raw materials, which should be recycled, and electronic components, which must be disposed of.

- ***Do not dispose of in household waste!***
- ***Observe the local regulations regarding disposal!***

- According to European provisions (guideline 2012/19/EU of the European Parliament and the Council of Juli, 4th 2021), used electric and electronic equipment may no longer be placed in unsorted municipal waste. It must be collected separately. The symbol depicting a waste container on wheels indicates that the equipment must be collected separately.
  This machine is to be placed for disposal or recycling in the waste separation systems provided for this purpose.
- According to German law (law governing the distribution, taking back and environmentally correct disposal of electric and electronic equipment (ElektroG) from 16.03.2005), used machines are to be placed in a collection system separate from unsorted municipal waste. The public waste management utilities (communities) have created collection points at which used equipment from private households can be disposed of free of charge.
- Information about giving back used equipment or about collections can be obtained from the respective municipal administration office.
- EWM participates in an approved waste disposal and recycling system and is registered in the Used Electrical Equipment Register (EAR) under number WEEE DE 57686922.
- In addition to this, returns are also possible throughout Europe via EWM sales partners.

6.5 Meeting the requirements of RoHS

We, EWM AG in Mündersbach, Germany, hereby confirm that all products which we supply to you and that are subject to the RoHS directive comply with RoHS requirements (also see applicable EC directives on the Declaration of Conformity on your machine).

7 Rectifying faults

All products are subject to rigorous production checks and final checks. If, despite this, something fails to work at any time, please check the product using the following flowchart. If none of the fault rectification procedures described leads to the correct functioning of the product, please inform your authorised dealer.

7.1 Checklist for rectifying faults

☞ ***The correct machine equipment for the material and process gas in use is a fundamental requirement for perfect operation!***

Legend	Symbol	Description
	↯	Fault/Cause
	🛠	Remedy

Welding torch overheated

↯ Insufficient coolant flow
- 🛠 Check coolant level and refill if necessary
- 🛠 Eliminate kinks in conduit system (hose packages)
- 🛠 Completely unroll the hose package and the torch hose package
- 🛠 Observe maximal hose package length (see chapter "Welding torch cooling")

> see 5.2.1.2 chapter

↯ Loose welding current connections
- 🛠 Tighten power connections on the torch and/or on the workpiece
- 🛠 Tighten contact tip correctly

↯ Overload
- 🛠 Check and correct welding current setting
- 🛠 Use a more powerful welding torch

Functional error with the welding torch operating elements

↯ Connection problems
- 🛠 Make control lead connections and check that they are fitted correctly.

Wire feed problems

↯ Unsuitable or worn welding torch equipment
- 🛠 Adjust contact tip (cold wire/hot wire) to wire diameter, blow through and replace if necessary
- 🛠 Adjust wire guide to material in use, blow through and replace if necessary
- 🛠 Enlarge liner or steel liner radius

↯ Kinked hose packages
- 🛠 Extend and lay out the torch hose package

↯ Incompatible parameter settings
- 🛠 Check settings and correct if necessary

↯ Lose inlet guide
- 🛠 Tighten inlet guide

↯ Torn or worn inlet guide
- 🛠 Replace inlet guide

↯ Torn jointing sleeve of the combined liner
- 🛠 Replace or reattach jointing sleeve

↯ Setting the spool brake
- 🛠 Check settings and correct if necessary

↯ Setting pressure units
- 🛠 Check settings and correct if necessary

Unstable arc

- Unsuitable or worn welding torch equipment
  - Adjust contact tip to wire diameter and -material and replace if necessary
  - Adjust wire guide to material in use, blow through and replace if necessary
- Material inclusions in the tungsten electrode due to contact with filler material or workpiece
  - Regrind or replace the tungsten electrode
- Arc between gas nozzle and workpiece (metal vapour on the gas nozzle)
  - Replace gas nozzle
- Incompatible parameter settings
  - Check settings and correct if necessary

Pore formation

- Inadequate or missing gas shielding
  - Check shielding gas setting and replace shielding gas cylinder if necessary
  - Shield welding site with protective screens (draughts affect the welding result)
  - Use gas lens for aluminium applications and high-alloy steels
- Unsuitable or worn welding torch equipment
  - Check size of gas nozzle and replace if necessary
- Condensation (hydrogen) in the gas tube
  - Purge hose package with gas or replace

7.2 Vent coolant circuit

☞ ***To vent the cooling system always use the blue coolant connection, which is located as deep as possible inside the system (close to the coolant tank)!***

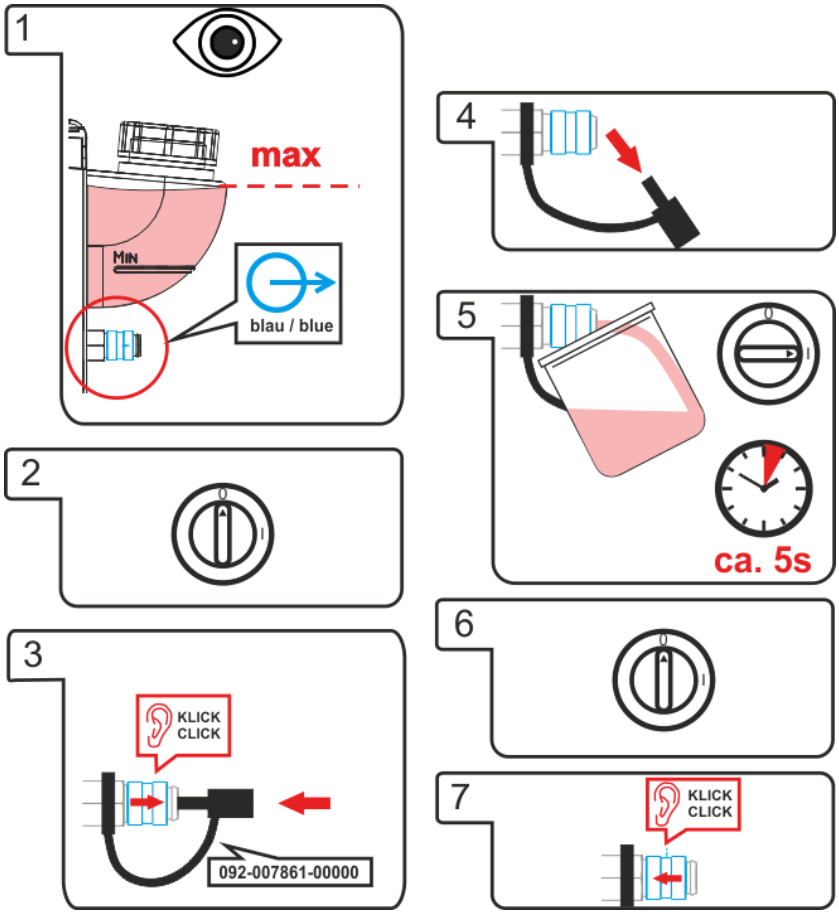


Figure 7-1

☞ ***Complete the following steps to vent the welding torch:***

- ***Connect the welding torch to the cooling unit***
- ***Switch on the welding machine***
- ***Tao the torch trigger***

Venting the welding torch starts and lasts for approx. 5 to 6 minutes.

8 Technical data

☞ ***Performance specifications and guarantee only in connection with original spare and replacement parts!***

8.1 TIG 200

Electrode polarity with DC	Normally negative
Guide type	Manually operated
Voltage type	DC or AC
Shielding gas	Shielding gas BS EN ISO 14175
Duty cycle (DC)	200 A/35%
Duty cycle (AC)	140 A/35%
Max. arc striking and voltage rating	12 kV
Switching voltage push-button	0.02–42 V
Switching current push-button	0.01–100 mA
Switching power push-button	Max. 1 W (ohmic load)
Electrode type	Standard TIG electrodes
Electrode diameter	1.6–3.2 mm (standard TIG electrodes)
Ambient temperature	–10 °C to +40 °C
Voltage measurement	113 V peak value
Protection classification of the machine connections (EN 60529)	IP3X
Gas flow	10–20 l/min
Hose package length	3 m/4 m
Connection	Decentral
Safety identification	CE
Harmonised standards used	see declaration of conformity (machine documentation)

8.2 TIG 260 / TIG 450

Type	TIG 260	TIG 450
Electrode polarity with DC	Normally negative	
Guide type	Manually operated	
Voltage type	DC or AC	
Shielding gas	Shielding gas BS EN ISO 14175	
Duty cycle (DC)	260 A/100%	400 A/100%
Duty cycle (AC)	185 A/100%	280 A/100%
Max. arc striking and voltage rating	12 kV	
Switching voltage push-button	0.02–42 V	
Switching current push-button	0.01–100 mA	
Switching power push-button	Max. 1 W (ohmic load)	
Electrode type	Standard TIG electrodes	
Electrode diameter	1.0–3.2 mm	1.6–4.8 mm
Required cooling capacity	Min. 800 W	
Max. supply line temperature	50 °C	
Torch input pressure, coolant	2.5–3.5 bar (min.–max.)	
Flow quantity (min.)	0.7 l/min.	
Ambient temperature[1]	–10 °C to +40 °C	
Voltage measurement	113 V peak value	
Protection classification of the machine connections (EN 60529)	IP3X	
Gas flow	10–20 l/min	
Hose package length	4 m/8 m	3 m/4 m
Connection	Decentral	
Safety identification	CE	
Harmonised standards used	see declaration of conformity (machine documentation)	

[1] Ambient temperature dependent on coolant! Observe the coolant temperature range of the torch cooling

9 Replaceable parts

9.1 TIG 260

☞ ***The manufacturer's warranty becomes void if non-genuine parts are used!***

- ***Only use system components and options (power sources, welding torches, electrode holders, remote controls, spare parts and replacement parts, etc.) from our range of products!***
- ***Only insert and lock accessory components into the relevant connection socket when the machine is switched off.***

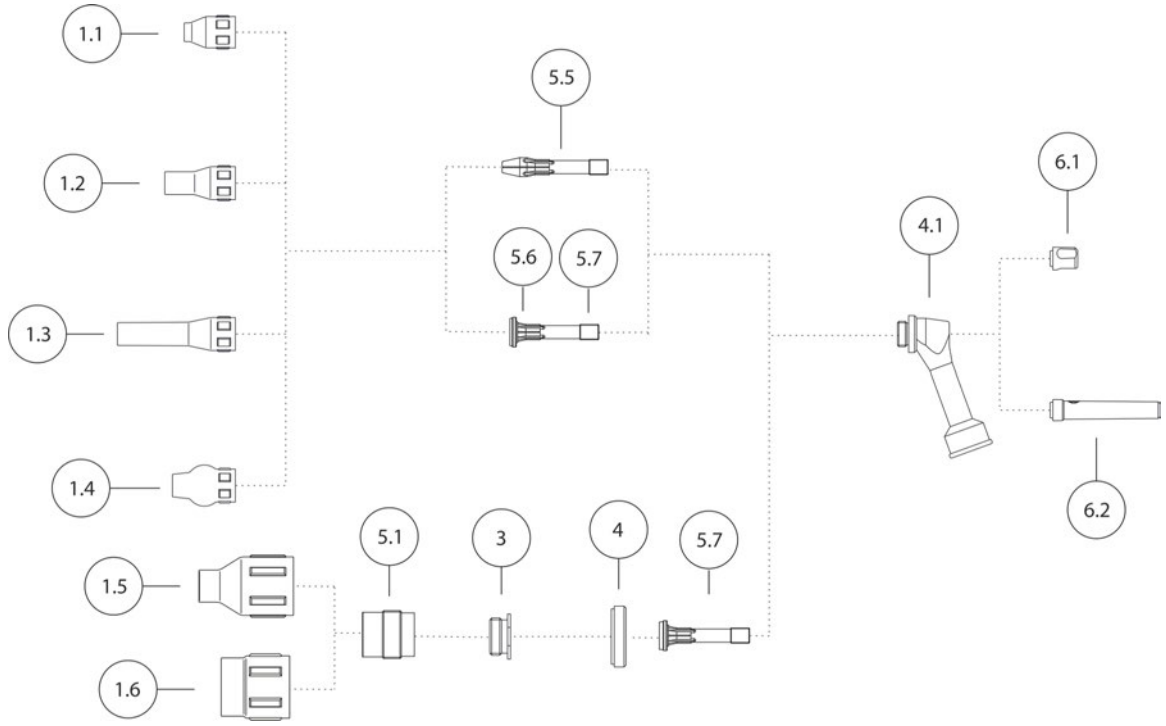


Figure 9-1

Item	Order number	Type	Name
1.1	094-011756-00000	GN TIG 150/260 S 10x26mm	Gas nozzle
1.1	094-011980-00000	GN TIG 150/260 S 11.5x26mm	Gas nozzle
1.1	094-012405-00000	GN TIG 150/260 S 8.0x26mm	Gas nozzle
1.1	094-012672-00000	GN TIG 150/260 S 6.5x26mm	Gas nozzle
1.2	094-011757-00000	GN TIG 150/260 11.5x26mm	Gas nozzle
1.2	094-011982-00000	GN TIG 150/260 10.0x26mm	Gas nozzle
1.2	094-012673-00000	GN TIG 150/260 6.5x26mm	Gas nozzle
1.2	094-012674-00000	GN TIG 150/260 8.0x36mm	Gas nozzle
1.5	094-009663-00000	GN DIF TIG 150-450/450SC, 12,5 x 50 mm	Gas nozzle for gas diffuser, JUMBO
1.5	094-009664-00000	GN DIF TIG 150-450/450SC, 16 x 50 mm	Gas nozzle for gas diffuser, JUMBO
1.5	094-009665-00000	GN DIF TIG 150-450/450SC, 19,5 x 50 mm	Gas nozzle for gas diffuser, JUMBO
2	094-013071-00000	CT M6 CuCrZr, D=0,8 mm	Contact tip
2	094-013072-00000	CT M6 CuCrZr, D=1,0 mm, L=28 mm	Contact tip
2	094-013122-00000	CT M6 CuCrZr, D=0,9 mm	Contact tip
2	094-016758-00000	CT M5X19 mm CuCrZr D=1,0 mm	Contact tip
2	094-016775-00000	CT M5X19 mm CuCrZr D=0,8 mm	Contact tip
3	094-011758-00000	ADAPT 150/260 XL	Adapter ring, JUMBO

Item	Order number	Type	Name
4	094-011760-00000	ISO TIG 150/260 XL	Insulator, JUMBO
4.1	094-011979-00000	ISO TIG 150/260	Insulator
5.1	094-009658-00000	DIF TIG 150-450/450SC, D=1,6 mm	Gas diffuser, JUMBO
5.1	094-009659-00000	DIF TIG 150-450/450SC, D=2,4 mm	Gas diffuser, JUMBO
5.1	094-009660-00000	DIF TIG 150-450/450SC, D=3,2 mm	Gas diffuser, JUMBO
5.1	094-022685-00000	DIF TIG 150-450/450SC Multilayer Ø 2.4 mm	Gas diffuser, multi-layer
5.1	094-023020-00000	DIF TIG 150-450/450SC Multilayer Ø 1.6 mm	Gas diffuser, multi-layer
5.1	094-023021-00000	DIF TIG 150-450/450SC Multilayer Ø 3.2 mm	Gas diffuser, multi-layer
5.1	094-023022-00000	DIF TIG 150-450/450SC Multilayer Ø 4.0 mm	Gas diffuser, multi-layer
5.6	094-023031-00000	CDIF TIG 150/260 Multilayer 1.6 mm	Gas diffuser, multi-layer
5.6	094-023033-00000	CDIF TIG 150/260 Multilayer 2.4 mm	Gas diffuser, multi-layer
5.6	094-023034-00000	CDIF TIG 150/260 Multilayer 3.2 mm	Gas diffuser, multi-layer
5.7	094-011984-00000	COL DIF 150/260 D=2.4MM	Gas diffuser
5.7	094-012669-00000	COL DIF 150/260 D=1.6MM	Gas diffuser
5.7	094-012671-00000	COL DIF 150/260 D=3.2MM	Gas diffuser
6.1	094-011752-00000	TCS TIG 150/260	Back cap
6.2	094-011753-00000	TCM TIG 150/260	Back cap

9.2 TIG 200 / TIG 450

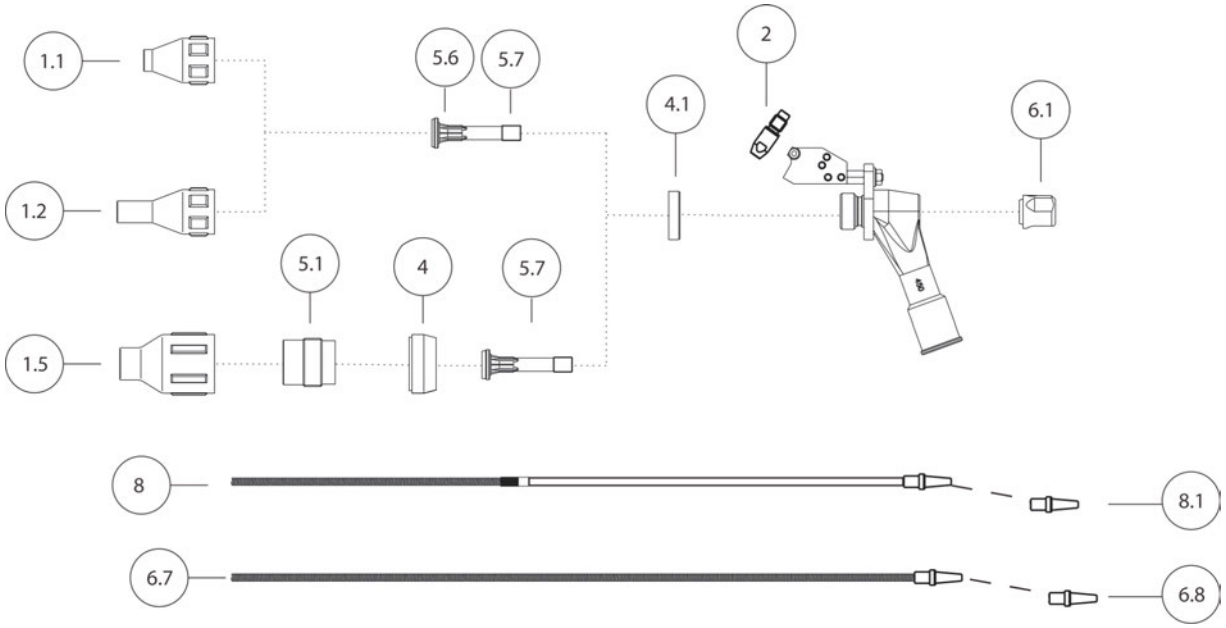


Figure 9-2

Item	Order number	Type	Name
1.1	094-009646-00000	GN TIG 200/450/450SC, 7,5 x 37,4 mm	Gas nozzle
1.1	094-009647-00000	GN TIG 200/450/450SC, 10 x 37,4 mm	Gas nozzle
1.1	094-009648-00000	GN TIG 200/450/450SC, 13 x 37,4 mm	Gas nozzle

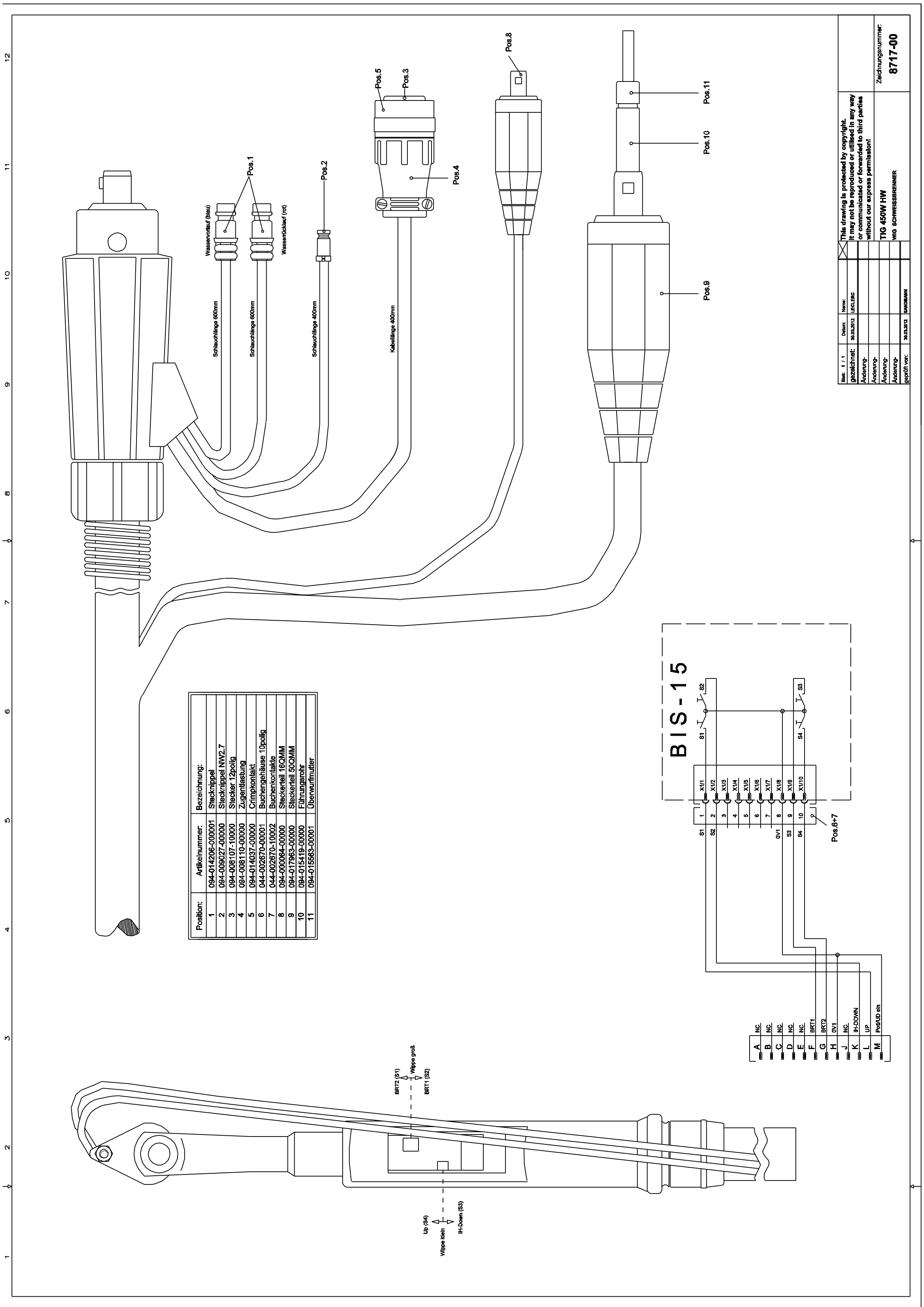
Item	Order number	Type	Name
1.1	094-009649-00000	GN TIG 200/450/450SC, 15 x 37,4 mm	Gas nozzle
1.2	094-009650-00000	GN TIG 200/450/450SC, 7,5 x 51,5 mm	Gas nozzle
1.2	094-009651-00000	GN TIG 200/450/450SC, 10 x 51,5 mm	Gas nozzle
1.2	094-009653-00000	GN TIG 200/450/450SC, 13 x 51,5 mm	Gas nozzle
1.2	094-009654-00000	GN TIG 200/450/450SC, 15 x 51,5 mm	Gas nozzle
1.5	094-009663-00000	GN DIF TIG 150-450/450SC, 12,5 x 50 mm	Gas nozzle for gas diffuser, JUMBO
1.5	094-009664-00000	GN DIF TIG 150-450/450SC, 16 x 50 mm	Gas nozzle for gas diffuser, JUMBO
1.5	094-009665-00000	GN DIF TIG 150-450/450SC, 19,5 x 50 mm	Gas nozzle for gas diffuser, JUMBO
2	094-013071-00000	CT M6 CuCrZr, D=0,8 mm	Contact tip
2	094-013072-00000	CT M6 CuCrZr, D=1,0 mm, L=28 mm	Contact tip
2	094-013122-00000	CT M6 CuCrZr, D=0,9 mm	Contact tip
2	094-014317-00000	CT M6 CuCrZr D=1,2 mm	Contact tip
2	094-016758-00000	CT M5X19 mm CuCrZr D=1,0 mm	Contact tip
2	094-016775-00000	CT M5X19 mm CuCrZr D=0,8 mm	Contact tip
2	094-016776-00000	CT M5X19 mm CuCrZr D=1,2 mm	Contact tip
4.1	094-011759-00000	INS TIG 200/450/450SC	Insulator
5.1	094-009658-00000	DIF TIG 150-450/450SC, D=1,6 mm	Gas diffuser, JUMBO
5.1	094-009659-00000	DIF TIG 150-450/450SC, D=2,4 mm	Gas diffuser, JUMBO
5.1	094-009660-00000	DIF TIG 150-450/450SC, D=3,2 mm	Gas diffuser, JUMBO
5.1	094-009661-00000	DIF TIG 150-450/450SC, D=4,0 mm	Gas diffuser, JUMBO
5.1	094-022685-00000	DIF TIG 150-450/450SC Multilayer Ø 2.4 mm	Gas diffuser, multi-layer
5.1	094-023020-00000	DIF TIG 150-450/450SC Multilayer Ø 1.6 mm	Gas diffuser, multi-layer
5.1	094-023021-00000	DIF TIG 150-450/450SC Multilayer Ø 3.2 mm	Gas diffuser, multi-layer
5.1	094-023022-00000	DIF TIG 150-450/450SC Multilayer Ø 4.0 mm	Gas diffuser, multi-layer
5.6	094-004969-00000	200/450/SC Multilayer Ø 2.4 mm	Gas diffuser, multi-layer
5.6	094-006255-00000	200/450/SC Multilayer Ø 3.2 mm	Gas diffuser, multi-layer
5.6	094-023018-00000	200/450/SC Multilayer Ø 1.6 mm	Gas diffuser, multi-layer
5.7	094-009640-00000	COL DIF TIG 200/450/450SC, D=1,6 mm	Gas diffuser
5.7	094-009641-00000	COL DIF TIG 200/450/SC 2.0mm	Gas diffuser
5.7	094-009642-00000	COL DIF TIG 200/450/450SC, D=2,4 mm	Gas diffuser
5.7	094-009643-00000	COL DIF TIG 200/450/450SC, D=3,2 mm	Gas diffuser
5.7	094-009644-00000	COL DIF TIG 200/450/450SC, D=4,0 mm	Gas diffuser
6.1	094-010723-00000	TCS TIG 200/450/450SC	Back cap
6.2	094-010601-00000	TCL TIG 200/450	Back cap

Item	Order number	Type	Name
6.7	092-018693-00003	D=2,0 x 4,0 mm, 3,5 m, St	Steel liner, steel
6.7	092-018693-00004	D=2,0 x 4,0 mm, 4,5 m, St	Steel liner, steel
6.7	092-018694-00003	D=2,0 x 4,0 mm, 3,5 m, CrNi	Steel liner, stainless steel
6.7	092-018694-00004	D=2,0 x 4,0 mm, 4,5 m, CrNi	Steel liner, stainless steel
6.7	092-018694-00005	DFS 2,0MM/4,0MM L=5,5M CRNI	Steel liner, stainless steel
6.7	092-018695-00003	D=1,5 x 3,3 mm, 3,5 m, St	Steel liner, steel
6.7	092-018695-00004	D=1,5 x 3,3 mm, 4,5 m, St	Steel liner, steel
6.7	092-018696-00003	D=1,5 x 3,3 mm, 3,5 m, CrNi	Steel liner, stainless steel
6.7	092-018696-00004	D=1,5 x 3,3 mm, 4,5 m, CrNi	Steel liner, stainless steel
6.7	092-018697-00003	D=2,0 x 4,0 mm, 3,5 m, CuZn	Steel liner, brass
6.7	092-018697-00004	D=2,0 x 4,0 mm, 4,5 m, CuZn	Steel liner, brass
6.8	094-020069-00000	ES 4,0MM	Inlet guide, spiral
6.8	094-020159-00000	ES 3,3MM	Inlet guide, spiral
8	092-018706-00003	LPA COMBI 2.0mm x 4.0mm 3.5m	Combined liner, PA
8	092-018706-00004	LPA COMBI 2.0mm x 4.0mm 4.5m	Combined liner, PA
8.1	094-014032-00001	WFN 4.0mm	Inlet guide

10 Service documents

10.1 Circuit diagram

☞ ***The circuit diagrams are only intended for authorised service personnel!***



11 Appendix A

11.1 Overview of EWM branches

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